SBRI Government challenges Ideas from business Innovative solutions

DfE Department for the Economy www.economy-ni.gov.uk

SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

NI Water c/o [redacted]

2. Department/Arm's length body name & address

Northern Ireland Water
Westland House,
40 Old Westland Road
BELFAST, BT14 6TE

3. Contact details

[redacted]

4. Challenge title

Energy storage within NI Water infrastructure

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

NI Water is the largest single purchaser of electricity in Northern Ireland, operating more than c.3,000 sites, the majority of which are network connected (i.e. 33kV and below). We consume in excess of c.290 GWh of electricity annually, representing over 3% of Northern Ireland's total annual demand.

This is one of the company's most significant areas of expenditure and is subject to global market conditions, which can cause significant price volatility making it challenging to have price visibility and manage budget.

Consumption of electricity is the main cause of NI Water's harmful greenhouse gas emissions (equivalent to 136k tonnes of CO_2 in FY2017/18).

The security and continuity of supply of electricity is critical for delivery of water and wastewater services and ensuring the resilience of our network is key.

Energy storage solutions have the potential to increase the resilience of the electricity supply to critical infrastructure water and wastewater services through the avoidance of interruptions associated with traditional diesel generator backup solutions.

EnMS003 Energy Policy:
Northern Ireland Water (NIW) is committed to the achievement of greater energy efficiency in all of its business activities within its operational control.
Within the constraints of maintaining our commitment to customers and protection of the environment, NIW will endeavour to minimise its energy consumption.

The policy aligns to NIW's Energy Sustainability and Resilience Strategy, which includes its Energy Vision Statement..."Use innovative approaches to energy and new technology to deliver NI Water's services for the lowest financial and environmental cost, whilst simultaneously maximising consumer and community benefits."

NI Central Government Strategy:
This proposed project is also in line with the 'Energy Management Strategy and Action Plan to 2030' recently published by the Strategic Investment Board who are supportive of NIW's approach. This energy strategy notes the action to 'Examine the potential for generation and storage across the Government estate' and provides a section on 'Generation and Storage Opportunities'. (see page 73 of relevant document via link below)

https://sibni.org/project/energy-management-strategy-and-action-plan-to-2030/

NI Water would like to overcome the challenge of incorporating energy storage technologies into the business in a manner which;

- Increases resilience of electricity supply to critical infrastructure water assets through the avoidance of interruptions to supply;
- Enables real time energy management capability;
- Improves the value of onsite renewable energy generation assets by increasing availability of its supply and hence the efficiency provided;
- Brings cost savings to utilities and consumers providing social economic benefits;
- Enables the increased participation in grid services market (including but not limited the ISEM Capacity and DS3 system services market) through a more resilient energy infrastructure;
- Enables future energy services opportunities.

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

Given NI Water's distributed range of assets and sizeable network connection, it is uniquely placed to participate in the grid services markets helping to manage demand and supply as the smart grid of the future develops. The ability to create the flexibility required to accommodate this step change will require the integration of energy storage technologies.

The operational and planning challenges created by the intermittent nature and location of asynchronous renewable generation may create significant opportunities for

NI Water. The business can play a key role in the 'Capacity' and 'Delivering a Secure Sustainable Electricity System' (DS3) services market and through time, develop into the energy trading and arbitrage market through the identification of flexibility within assets and the integration of new technologies such as energy storage solutions.

The appropriate investigation and development of opportunities provided by energy storage would increase the quality and security of the service provided by the business as well as paying their way over their operational life in terms of financial benefits (through the provision of grid services).

A successful outcome would demonstrate how energy storage solutions can be incorporated into NI Water infrastructure in a manner which:

- Increases resilience of electricity supply to critical infrastructure water assets through the avoidance of interruptions to supply;
- Enables real time energy management capability;
- Improves the value of onsite renewable energy generation assets by increasing availability of its supply and hence the efficiency provided;
- Brings cost savings to utilities and consumers providing social economic benefits;
- Enables the increased participation in grid services market (including but not limited the ISEM Capacity and DS3 system services market) through a more resilient energy infrastructure;
- Enables future energy services opportunities;

The outcome and solutions may incorporate a range of technologies combined to provide a complete solution.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

This project aims to carry out the appropriate investigation and development of opportunities provided by energy storage within NI Water infrastructure. The project should inform what opportunities are available and where feasible will provide outcomes which align with the Programme for Government Outcomes and Indicators in the following way:

- ***PfG Outcome and Indicators:***

No.2 ~ Looking after the planet:
Improving the air we breathe; and Cutting down the amount of energy that is wasted.

Project aligns with this as:
Energy storage informs better energy management through flexibility and reduction of greenhouse gas emissions whilst directly supporting wider UK Government objectives on energy and climate action.

This project may, through the increased provision of ISEM DS3 System Services, lead to an increased penetration of asynchronous renewable generation in the Northern Ireland electricity network. This provides an opportunity for Government to demonstrate an important emissions reduction contribution to both the draft PfG indicator 29 (Greenhouse gas emissions) and the UK wide Climate Change Act to reduce greenhouse gas emissions by at least 80% by 2050.

- ***PfG Outcome and Indicators:***

No. 8 ~ Caring for people in need:
Reduced poverty (Assisting those living with the most difficult conditions).

Project aligns with this as:
Energy storage can be used to provide a range of system services which help to manage and stabilise the whole electricity grid reducing the need for large scale capital expenditure on grid infrastructure works. This contributes towards a reduction in the non-commodity cost of electricity to all consumers especially those who can't afford to install renewable technology.

- ***PfG Outcome and Indicators:***

No. 11 ~ High quality public services:
Using new technology so that services work better and are good value for money; and sharing things to save money.

Project aligns with this as:
Energy storage increases energy management capability, which is an imperative to ensure Government achieves value for taxpayers. It also enhances security of energy supply through the provision of system services and improves the resilience in the provision of water and wastewater services by enhancing the resilience in the energy network.
The intention is to knowledge share the outcome of research and development of energy storage with other public bodies, eg NI Health & Social Care Trusts.

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

NI Water recognise that the development of energy storage may benefit other parties and will contact the following entities to discuss possible collaboration:

- NI Health and Social Care Trusts;
- Irish Water;
- Scottish Water.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

- Phase 1 - £150K (6-9 Months);
- Phase 2/3 – It is recognised that the funding required for phase 2/3 is of a scale inappropriate to the SBRI funding route. NI Water will work closely with the

Department of the Economy and others as appropriate to identify various funding routes for Phase 2/3;

Estimates provided are exclusive of VAT.

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name: [redacted]

Signed: [redacted]

Position in organisation: Programme Manager (Level3)

Date: 3/4/19 [redacted]

Endorsed by: [redacted]

Position in organisation (at least SCS level): Director (Level 2)

If relevant, endorsed by Parent Department (SCS level): _____

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words **'SBRI Challenge Fund Expression of Interest'** in the email subject box. The deadline for applications is **4pm on 5 April 2019.**

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DfE Department for the Economy www.economy-ni.gov.uk

SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

[redacted]

2. Department/Arm's length body name & address

Education Authority, 40 Academy Street, Belfast BT1 2NQ

3. Contact details

[redacted]

4. Challenge title

School Bus Digital Travel Pass – Smart School Transport Project

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

The EA is a non-departmental body sponsored by the Department of Education, and in April 2015 replaced the five former Education and Library Boards.

The EA is responsible for ensuring that efficient and effective primary and secondary education services are available to meet the needs of children and young people, and support the provision of efficient and effective youth services.

Although parents are ultimately responsible for ensuring their children attend school, the EA has responsibility for providing assistance with home to school transport where a child meet certain eligibility criteria i.e. Living beyond a certain distance from school, or where they have special needs or where the walking route is deemed unsafe.

The EA currently provides about 80,000 (approximately a third of the school population) with transport assistance – either a place on the EA's own fleet, a Translink service or on a vehicle operated by a private contractor.

Currently, the EA operates a large fleet of more than 800 vehicles across Northern Ireland.

For the past 2 years the EA has been undergoing a process of transformation in its home to school transport services including:

- creating a GIS digital network of all EA bus routes, stop and journey information and making this available to parents online;
- a new digital channel offering parents the ability to apply for home to school transport assistance on line;
- unifying its transport data base, providing one single unified data base for the management and maintenance of the EA school bus fleet; and
- undertaking the SBRI Smart school bus project which utilises RfID, NFC and Biometric means to monitor pupils' boarding and alighting, ensuring the EA can monitor school bus service performance, loadings, and improve pupil safety.

The first phase was a short 3 month sprint, that demonstrated the potential of the prototype to be used on bus and by pupils. Three companies undertook the first Phase and two (Kinsetsu and Analytics Engines) successful moved to Phase II to allow for on bus and with pupil testing of the applications/operations.

Due to the limitations on time, the requirements of obtaining parental permissions and technical issues field testing during Phase II was limited to small geographic areas and a limited number of bus routes, and for a duration of only 2 weeks during November/December.

The EA would like to be in a position to move to procurement of a smart school bus solution in 2020/2021, however the technology requires additional field testing at scale to ensure that issues of:

- reliability (in a wide range of geographic and operating environments over a prolonged period of time)
- maintenance costs (on a range of fleet vehicles)
- acceptability (to maintenance staff, drivers, and pupils/parents and schools)
- cost (capital and operating)

can be established, and to enable the use of the technology to identify the potential for savings e.g. from fuel, improved vehicle utilisation etc can be assessed to build a business case to move to procurement. .

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

A successful outcome from Phase III would be testing at a scale that provides the EA with the confidence that the solution(s) developed could be financially and operationally feasible to apply to the entire fleet, and would be acceptable and beneficial to pupils, parents, schools and EA transport staff in terms of improving the quality of service and safety of users.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

This project aligns well with the EA's strategic priorities for the next 10 years, and with the Programme for Government, specifically:

- High quality public services – usage of on line channels to access public services
- Connecting people and opportunities through infrastructure including reducing average journey times

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

Potential partners include a number of primary, special and secondary schools across Northern Ireland. Several schools including St Catherine's, Armagh, Cookstown, Dungannon, Castle Tower, Rossmor, St Malachy's and others have already participated and indicated that they are willing to participate in the further and more extended trials.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

A total of £150,000 excluding VAT is sought for Phase III for a period of 9 months (i.e. May 2019 to February 2020).

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name [redacted]

Signed [redacted]

Position in organisation TRANSPORT MANAGER

Date 26/03/19

Endorsed by [redacted]

Position in organisation (at least SCS level) Acting Director Q&S+Estates

If relevant, endorsed by Parent Department (SCS level) [redacted]

DE Head of Home to School Transport Team.

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On behalf of [redacted]

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SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

[redacted]

2. Department/Arm's length body name & address

Department for Infrastructure (DfI), Road

3. Contact details

[redacted]

4. Challenge title

The use of emerging technologies to optimise public assets to deliver a predictive analysis tool for highway maintenance.

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

There is an on-going challenge with highway deterioration which is causing a public reaction to defects and in particular potholes. The amount of vehicle damage compensation paid by government is used as an indication of the problem and in recent years this has increased. Last month a report by the Northern Ireland Auditor General identified that '*a growing maintenance backlog of £1.2 billion exists as a result of long-term underfunding*'. This same issue was highlighted in the Barton Review which concluded that £143M should be spent annually on the

road network in Northern Ireland to ensure it is fit for purpose, and over the last five years this figure has been no more than £100M annually.
The road network is subject to a routine visual inspection to identify defects but there is currently no real time data about the quality of the road surface. In effect DfI utilise a reactive road maintenance approach and if we were able to use data from numerous sources it would add intelligence to the decision making process and a more proactive system could be adopted. This would enable engineers to anticipate when particular stretches of road will require attention, allowing earlier interventions which will save costs in an area which is significantly underfunded.

DfI has already made some moves to harness data from others as citizens can report defects using NIDirect or online, but this is still based on a visual observation and is reactive. All defects are categorised and their severity will determine the repair priority. Page 5 in the attached link includes a table which sets out the details around the defect repairs.

https://www.infrastructure-ni.gov.uk/publications/road-maintenance-standards-safety-limited-service-201819-dem-16018

The report by the Northern Ireland Auditor General also identified that '*without more certainty around future funding levels, the Department is inhibited from managing its structural maintenance programme effectively or efficiently*'. Clearly if we can better utilise public assets, data and resources, this could enable the optimisation of maintenance activities and this would assist with the maintenance of an effective and efficient road network.

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

This application plans to address the lack of real time information about the highway and its deterioration with the adoption of emerging technologies to capitalise on the improved utilisation of public assets.

This project will investigate ways in which data may be captured, stored and analysed from public assets. This could be through sensor IOT technology, image based systems, publicly available data or a combination of technologies. When technology is applied to a transport fleet it can be used to capture intelligent data to measure highway degradation, the presence of potholes and the potential conditions which make road surfaces susceptible to defects. The significant size of the public service transport fleet will provide a platform for real time data capturing which has the potential to cover much if not all the 26,000 KM road network in Northern Ireland. Partnering with Digital Catapult NI (DCNI) the Department will also link emerging technologies with data by accessing the DCNI Things Connected LoraWan network available across Northern Ireland. The road surface data matched with location information and utilising Machine Learning algorithms will enable DfI to develop Predictive Road Maintenance schedules.

Analysing the data gathered by the sensor technology will provide the opportunity to identify and categorise road defects in such a way that the need for manual inspections is optimised. This will result in improved staff workflow and ultimately reduced costs.

Using AI, the data collected by sensor networks will allow for the predictive analysis of road degradation. This can then be used to deliver a proactive road repair schedule. Together these will provide the opportunity to develop a framework for on-going and future highways maintenance. This is an innovative approach by DfI for utilising human and capital resources. When achieved this will be a transferable business model to other public bodies and will have an immediate application to numerous road authorities across the UK who are all facing the same funding challenge.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

The Project aligns with several of the PfG strands, these include:

22. Increase innovation in our economy - we are offering an innovative solution utilizing emerging technology that has the potential to be an exemplar for other regions

23. Improve transport connections for people, goods and services - well maintained roads will lead to less disruption and better journey times for goods and people

This also aligns with strengthening the innovation ecosystem as part of the NI industrial strategy, particularly driving innovation within and from the public sector. In this instance we will be de-risking an initiative where highly skilled micro business can demonstrate proof of concepts and if successful these will subsequently improve the quality of roads for the public.

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

This would be a collaborative research and development project building on the experience and expertise of Digital Catapult NI (DCNI) in delivering innovative solutions using AI / Machine Learning and future network technology including IOT. DCNI would act as project coordinators building on their relationship with the public sector and innovators in this area. DCNI are a position to facilitate open calls to the most capable UK based technology companies to provide the technical solutions and we would utilise the LoraWan Things Connected Network owned by DCNI and maintained by Ulster University

The project team will also engage stakeholders such as Durham City Council who have undertaken a number of SBRI R&D projects via the Gov Tech Catalyst on the use of sensor technology to deliver improved local authority services.

DCNI, where necessary, will also engage the Catapult Network partners such as Satellite Catapult to enhance project capabilities.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

- **Phase 1 - £170,000 – 6 months**

Phase 1 of the project will allow the team to investigate ways in which data may be captured, stored and analysed from public assets which could be through sensor IOT technology, image based systems, publicly available data or a combination of technologies. A key stage in Phase 1 will include a detailed investigation into the most effective ways to utilise the Things Connected LoraWan. This investigation will include research into the feasibility for full scale data capture. In line with DCNI objectives, the team would look to work with technology SME's with extensive experience in data collection methods and/or IOT technologies and/or data analytics (AI). DCNI Machine learning algorithms will be described and developed that will allow captured data to be analysed to build potential predictive models. A pilot system will be deployed for use on a small number of different vehicles to create a test bed for data capture and analysis. The expected outcome of Phase 1 will be a

proof of concept application to demonstrate use of data capture to deliver predictive analysis for highway degradation and defects.

- **Phase 2 - £450,000 – 24 months**

Phase 2 will enable the team to conduct a feasibility study on data quality, communications and data infrastructure to enable wide spread implementation of the Proof of Concept. Model Quality and the ability to infer road quality will be assessed and if required additional sensing, data collection and AI methods will be described and implemented. If necessary and in line with DCNI objectives, the team would look to work with a technology SME in data collection methods to scale solution and company growth. In addition, phase 2 would also enable the project to review across departments and public bodies as to how any data generated and / or systems deployed could be used elsewhere. Obviously, this project relies on data capture and communications both in rural and urban centres. Therefore, gap analysis on connectivity and future network capability on Satellite or 5G communication will be evaluated. This will enable a growth plan for any solution to be marketable, commercialised and scaled across multiple markets for asset management.

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name [redacted]

[redacted]

Signed

Position in organisation: Divisional Roads Manager, DfI Roads- Northern Division

Date 05/04/2019

Endorsed by [redacted]

Position in organisation: Director of Network Services

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name [redacted]

[redacted]

Signed

Position in organisation: Divisional Roads Manager, DfI Roads- Northern Division

Date 05/04/2019

Endorsed by [redacted]

Position in organisation: Director of Network Services

If relevant, endorsed by Parent Department (SCS level): N/A

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SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

[redacted]

2. Department/Arm's length body name & address

Business Services Organisation, Franklin street, Belfast. BT2 8DQ

3. Contact details

[redacted]

4. Challenge title

Trust-based Project Staff to support the GovTech Prescribing Pathway SBRI

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

The current challenge for the medication pathway is the complex flow of the patients and information sharing when people enter custody from home, police cell and court. People arriving from court are kept to the end of the day and are then transported to Prison between 5-7pm when medical and pharmacy services are closed. Verification of current medication is done using the Electronic Care Record (ECR), but by the time people arrive into prison the GP surgeries are closed for consultation. Operationally it is only when people arrive in Prison that a consent form is signed and ECR is accessed to start the prescribing process. 13% of medications are prescribed on the first night by the committal nursing team.
What matters most to the people entering custody is that medication is administered on time and that communication is clear and respectful. The current committal process is not focused on quality outcomes. It has very limited performance indicators, all of which are retrospective, quarterly and measure focus on process not outcomes. Data systems are foundational to operational quality control.

The prestigious National GovTech SBRI award has funded the 2 phase SBRI,

SBRI CHALLENGE FUND APPLICATION 2019/20

Project Title	Innovating the **P**rescribing **P**athway **i**n **P**rison Healthcare Project '**acronym**' - **PPIP** **Project Support and Management**
Funding sought	**Year 1 - £60384.75** **Year 2 - £60384.75** **Total - £120,769.50**
Lead Clinician	[redacted]
	Consulted (Y/N) Y
	Content to support (Y/N) Y
Trust Director	[redacted]
	Consulted (Y/N) Y
	Content to support (Y/N) Y
Departmental Policy Lead	
	Consulted (Y/N)
	Content to support (Y/N)
Confirmation from key organisation which will support company that staff resources can be released (required at Director level)	[redacted]

which is 5 suppliers x £50k in Phase 1 and 2 suppliers x £500k in Phase 2. The £1.25m will only resource the suppliers. The service is extremely stretched and there are now concerns vis-à-vis the level of in-service staff resources such that the potential benefit the SBRI could yield may not be realised and delivery of the SBRI may be extremely challenging without additional project support funding.

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

The posts will allow delivery of the previously funded project.
Impact on services
1) To improve the flow of medication for people entering custody i.e. to streamline the medication pathway to remove non-value adding processes, reduce delays, targeting a reduction in omitted medication dose by 60%, improving the health and safety of people as they enter prison.
2) To innovate communication in the committal process through the use of real-time information sharing across stakeholder organisations – NIPS, PSNI, Court Service, SEHSCT and Service Users.
3) To reduce incidents on prison landings related to delayed medication.
Operational process measures must be integrated into the flow of the service, including real time performance data analysis, to introduce sustainability into the system.
The project's outcome will be to improve the efficiency of the prison prescribing pathway, enhancing the patient experience and their well-being. The design will maintain confidentiality, data protection and the innovative technology must be compatible with the secure systems of NIPS, PSNI, Court Service and SEHSCT

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

This project aligns with two PfG outcomes:
4- We enjoy long, healthy, active lives
11- We have high quality public services
Outcome 4 The issues in meeting this outcome include helping people when they need support, delivering the best possible outcomes and patient experience. It is important to note also that 89% of respondents to the draft programme for government consultation felt that this objective was important to include in the final programme for government document.
Outcome 11 people rely on public services and they rely on them being delivered well. The quality of service is critical to increasing people's wellbeing. This objective also focuses on delivering responsive public services designed with the end user in mind, ending the silo culture and using co-design between different organisations involved in process. There was strong support for the inclusion of this outcome among online respondents to the consultation on the Draft Programme for Government framework (83% in favour of its retention as currently worded, and only 4% advocating removal from the Programme.

This project aligns with these as it is working towards improved patient care in prisons by delivering medication in a timely manner to people entering prison. The aim is to improve the service by providing a solution to interface across various channels (NI Prison Service, court service, police and Forensic Medical services) to improve flow and recording of information and timeliness and quality of care to vulnerable patients.
8.

9. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

There are no potential funding partners. GovTech SBRI have funded £1.25m to execute the SBRI but this is to specifically fund suppliers not the Trust and yet the delivery of this project will be demanding and for effective delivery additional resource is required.

10. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

Year 1 (June 2019- March 2020)- 9 months
£51,611 –Clinical Lead 0.5 WTE
£28,902 - 1WTE Band 4
Full year- £80513
Year 1- £60384.75

Year 2 (April 2020- December 2020)- 9 months
£51,611 –Clinical Lead 0.5 WTE
£28,902 - 1WTE Band 4
Full year- £80513
Year 2- £60384.75

Total - £120,769.50

Expressions of Interest must be:

(i) signed by the lead applicant;

(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Expressions of Interest must be signed by: **(i) the Lead Applicant** **(ii) and, endorsed by a Director or equivalent senior representative from the applicant organisation**	
Signed	[redacted]
Date	**12:03:19**
Lead Applicant Name	[redacted]
Position in Organisation	**SBRI Executive**
Endorsed by	[redacted]
Position in Organisation	**Director Operations**

Submission of Business Case Info

Email SBRI BC must be sent to [redacted]@health-ni.gov.uk

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words '**SBRI Challenge Fund Expression of Interest**' in the email subject box. The deadline for applications is **4pm on 5 April 2019.**

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SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

Innovative solutions using *intelligent* crowd sourcing of question items to improve educational outcomes of pupils in Northern Ireland

2. Department/Arm's length body name & address

CCEA

3. Contact details

[redacted]
CCEA Council for the Curriculum, Examinations and Assessment
29 Clarendon Road, Clarendon Dock, Belfast. BT1 3BG.
T. +44 (0) 28 90 261230
E. [redacted]
W. www.ccea.org.uk

4. Challenge title

Intelligent Crowd sourcing question items for post-primary examinations and assessment

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

There are currently more than 300,000 pupils in Northern Ireland's schools and further education colleges. Each summer CCEA marks over half a million GCSE and GCE examination scripts across a range of subjects (see http://ccea.org.uk/qualifications).

As Northern Ireland's leading awarding body, CCEA offers a diverse range of

qualifications, including GCSEs, GCEs (AS and A levels), Entry Level Qualifications and Vocational Qualifications. Schools and colleges have a wide choice of qualification providers, but currently about 9 in 10 of the GCSEs taken in Northern Ireland are CCEA qualifications and its share of GCE entries has grown. CCEA is keen that this continues.

Educational questions for testing and examinations are currently developed by teachers, either in their own school or as part of assessment teams commissioned by CCEA.

Although this has been a long established and effective way of working, CCEA is seeking to expand the offer of valid and reliable question banks to teachers and schools/colleges, while maintaining standards and reducing the cost of the service.

There are informal online engines to support teachers, but CCEA requires a tool that provides the **level of security, workflow and control suitable** for state public examinations. However, it is thought that technology provides an opportunity to develop questions in a 'crowd-sourced' manner.

This would increase available question items for examinations and assessment, potentially increase the quality of questioning in schools and reduce cost. Such tool(s) would be expected to have wide/global market interest, particularly in subjects that are common across National Curricula.

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

Initially, CCEA sought a crowd sourcing solution only with the focus of the challenge being to increase the supply of question items for examinations and assessment, using the power of crowd sourcing to generate a wider pool of potential educational authors and items.

However, in response to the invitation to tender other solutions were proposed, including using AI (Artificial Intelligence) to improve the quality assurance of examination questions. The concept for both solutions was therefore tested at Phases I and II.

Phases I and II showed that the concept of a crowd sourcing platform is feasible to source examination questions. However, there is a need, through further testing, to explore the acceptability and user experience (including arrangements for payment) with potential question authors.

Phases I and II have also demonstrated the concept of an AI tool that can automate the process of identifying 'good' and 'bad' exam questions. This could potentially reduce the time involved in checking questions and also improve the standard of questions (including grammar, spelling, syntax, balance and consistency) and remove bias in examination papers. To date, this has been

tested with only one subject (Biology).

A further phase of extended testing is required. This will include:

- reducing the time to create examination papers by preparing the first draft;
- enabling focus of 'human' time to be on the most creative element of the process;
- leveraging the best available questions;
- assembling an appropriate range of questions;
- positioning the questions in order of 'difficulty' & 'cognitive level';
- achieving balance of specification & question type; and
- critically for CCEA, the need to have detailed quality assurance processes to ensure question validity and reliability.

In addition, a third phase is required to enable automatic evaluation of question items benchmarking against human performance to ascertain the level of reliability, and to demonstrate the ability to provide effective feedback to examiners during the question creation and refinement process using data analysis on performance to identify and support future training needs.

This would be the third phase of an existing SBRI that has shown considerable promise, but has not yet reached the point where the contractors would be able to self-fund the remaining work to reach the stage of commercialisation.

The AI element of the work, enabling evaluation and analysis of questions submitted to the crowd sourcing platform, has emerged as an area of considerable innovation. This is an area where further development and CCEA input will be crucial to train the AI systems for a wider range of subjects.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

The relevant key indicator is:

- PfG - Give our young people and children the best start in life.
- Supporting public sector Digital Transformation of Education sector.
- Upskilling the educational workforce, supporting improvements to education service to our learners.
- Developing private sector partners to support the needs of the education sector, while growing their businesses.
- Reducing costs while improving quality.

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

Partners

School partners and C2K setting for user testing

CCEA Examiners as key users of the service

Other awarding bodies who may wish to commission use of the service

All partners have been involved in phase I and II and continue to have interest in this project developing.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

- Phase III would require a period of comprehensive testing and evaluation of the AI engine and user testing of crowd sourcing application with examiners leading to final development of and integration with each application.
- Duration would be from April 2019 – March 2020.
- An estimate of the required cost is £150,000.00 (excluding VAT).

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name [redacted]

Signed [redacted]

Position in organisation Business Manager

Date 22.03.19

Endorsed by [redacted]

Position in organisation (at least SCS level) Chief Executive.

If relevant, endorsed by Parent Department (SCS level)

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words **'SBRI Challenge Fund Expression of Interest'** in the email subject box. The deadline for applications is **4pm on 5 April 2019.**

SBRI Government challenges ideas from business innovation here

DfE Department for the Economy www.economy-ni.gov.uk

SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

[redacted]

2 Department/Arm's length body name & address

Education Authority
Armagh Office, 3 Charlemont Place, The Mall, Armagh, BT61 9AX

3 Contact details

[redacted]

4. Challenge title

Making better use of multi-agency data (including health, education and social care) to improve support for children with special needs.

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

Approximately 20% of the school population will have an identified special educational needs during their school career (Warnock report). These pupils will have varying levels of needs and consequently support needs, with the most severe requiring a statement of special educational needs.

The incidence and type of SEN is changing, with more and more pupils having complex behavioural, social, communication and learning difficulties. Often these pupils' have complex social needs as well, and multiple agencies are involved in their care and welfare e.g. health, social care, education, post 16 education providers, police, probation/youth justice, housing, school transport etc.

Once a child is identified as potentially having special educational needs there is a duty on the education authority to undertake an assessment and if necessary to

prepare a statement of SEN setting out the educational and non educational needs of the child and the support that will be provided to meet those needs.

The guidance sets out clear requirements for the assessment process and preparation of a statement (and annual review), which will require documentary input from professionals including psychologist, Consultant Paediatrician , social worker, parent etc. Currently, much of this process in the UK (NI and GB for Education and Health Care Plans as well as a similar process in the Republic of Ireland) is paper based, dependent upon traditional letter correspondence.

Although the process is subject to statutory time limits, tracking for compliance must be undertaken manually, and parents or professionals are not able to see easily or quickly progress or where documents/information is awaited.

As children develop their needs are likely to change, although there is an annual review process, this is again often paper based, and key changes for example to equipment such as wheelchairs, special seating or to medication may not be communicated quickly or effectively to support services such as transport.

As a result, the system is dependent upon individual staff manually tracking the process of assessment, review or changes to a child's needs. Data sharing between agencies/departments and support services is often patchy which can compromise service standards and safety, and there is frequently duplication of assessments and provision of information by parents and other professionals.

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

A successful outcome would be more efficient and effective use of CYPS data and provide a child centric and insight driven service for parents, carers, and young people with special needs.

Gaining insights from unstructured and unconnected education data will better inform policy, reduce costs and improve service and outcomes for parents, carers, and young people with special needs in Northern Ireland.

Data security and privacy are key issues, as are an interface with the existing Capita One system.

The aim would be to enable professionals to update relevant information on an ongoing basis about the child, and that key changes can automatically be flagged to relevant agencies for example is a child's medication regime is changed, if carer information or looked after status changes this can be flagged to the school, to transport, or to social services where relevant.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

The project would deliver on the EA's values of Openness, respect, excellence and equality.

It would align well with the EA's strategic priorities for the next 10 years, and with the Programme for Government, specifically:

- High quality public services – usage of on line channels to access public services
- Improves life satisfaction scores of people with disabilities

And contribute towards improving the outcomes of children, giving young people the best start in life.

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

Partners

- The proposal if successful would be developed in collaboration with key special schools
- Bus Eireann have indicated they would be keen to collaborate, as they manage the delivery of special education transport for approximately 20,000 pupils in the Republic of Ireland and data management/sharing is a similar issue faced there.
- EA will work closely with the Public Health Agency who will be involved in the project.
- It is also envisaged that parent advocacy group(s) would be involved in the design stage and students themselves involved where appropriate.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

- An estimate of the required cost is £200,000 00 (including VAT), with £50k allocated to Phase 1 and £150,000 allocated to Phase II It is anticipated that up to 5 suppliers would be invited to participate in Phase 1 (£10k each) maximum) with up to £75,000 for more extensive development in Phase II with 2 suppliers.

Expressions of Interest must be:

(i) signed by the lead applicant;

(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,

(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name

Signed [redacted]

Position in organisation Director of Children & Young People's Servs

Date 1.4.19.

Endorsed by [redacted]

Position in organisation (at least SCS level) DIRECTOR OF INCLUSION + WELLBEING

If relevant, endorsed by Parent Department (SCS level) DE 2.4.19

Applications must be submitted via email to sbri@economy.ni.gov.uk Please ensure that you use the words 'SBRI Challenge Fund Expression of Interest' in the email subject box The deadline for applications is 4pm on 5 April 2019.

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Small Business Research Initiative (SBRI) Challenge Fund application: Phase 2

Name

[redacted]

Organisation/Department name & address

Department of Justice and Belfast City Council – Joint Application

Email address

[redacted]

Challenge title

'Amazing Spaces, Smart Places' – Phase 2

CRITERIA

1. Provide evidence of how a further phase of the project will address efficiency/sustainability.

Promoting positive and proactive use of parks and open spaces throughout Belfast continues to be a priority for Belfast City Council. Indeed the 'Belfast Agenda' specifically states that by 2035 '***Belfast will have a well-connected network of high-quality open spaces recognised for the value and benefits they provide to everyone who lives in, works in and visits our city***'.

Belfast Open Spaces Strategy 2019 identifies specific actions to be taken in partnership which will enable this. They are:

- Protect and improve existing open spaces
- Target areas of inaccessibility
- Leverage development and growth
- Create temporary or meanwhile uses
- Build stronger communities
- Improve safety and security

As identified above, there are specific opportunities and challenges in achieving this goal. Phase 1 SBRI sought to increase public sector understanding and knowledge of how innovation and the SME sector could support this goal. Additional learning from Phase 1

was achieved as a result of political and community interest in parks/open spaces, how important it was to build understanding of innovation at a political and community level and involve them in the development of solutions.

This Phase 2 application will work with a minimum of two Phase 1 SME's whose Initial prototype and field testing demonstrated high levels of potential in the achievement of the strategic goals identified above, but also the specific Phase 1 objectives.

Phase 2 objectives are an extension of the Phase 1 objectives but updated to include the learning from Phase 1:

- Enable public sector partners to be better informed to procure and deploy innovative solutions
- Support better co-ordination between agencies and reduce cost to the public purse
- Enable the participation of communities in further design and testing
- Increase the knowledge and understanding of politicians and communities on how innovation and technology can support them
- Increase the knowledge and understanding of SME's on how communities perceive technological solutions and associated privacy concerns
- Better informed public sector partners regarding the allocation of resources
- Support the integration and analysis of real time data that could generate useful insights reference the use of the open space and shape early intervention programmes and rapid multiagency responses

A further phase will also demonstrate broader societal outcomes

- Open spaces are more welcoming environments enjoyed by everyone
- Increased positive usage and animation of open spaces
- Empowered and involved communities
- Crime and anti-social behaviour is reduced in the City's open spaces
- Maintenance and security costs are reduced

2. Indicate how the technical feasibility was demonstrated at phase 1 – also identify barriers and issues.

During Phase 1, all companies specified the equipment and software that would successfully satisfy the challenge requirement.

Configuration of the systems and collation and processing of data have been developed.

Interim reports have detailed key deliverables and outcomes to date. Examples included :-

- Development of Graphical User Interface
- Cellular Communication Module
- Back end processing engines which provide data to web application and AI/Machine learning engines
- AI.Machine learning engine which processes the data and alerts applications of unusual pattern activities
- Gathering Council requirements and exploring the objectives of the data analytics
- Wi-Fi probe devices have been developed that will connect to off-the-shelf wireless receivers
- Detailed design plans, filtering, aggregation, exporting third party access and storage have been detailed by some of the companies and are all ready for phase 2

All the above has been completed within Phase 1 budget

Privacy and GDPR Compliance has required extensive engagement with each of the companies. All companies have been working directly with BCC legal teams throughout Phase 1. All companies have shared GDPR policy documents and final versions of DPIA's

have been drafted.

3. Indicate how emerging findings from phase 1 give confidence that solutions are progressing satisfactorily to address organisational needs. This may include variations/amendments to phase one specification.

All companies delivered interim presentations and reports to the stakeholders overseeing the challenge brief prior to recommendation of final payment within Phase1.

Each company was required to provide updates on idea progression, concepts and prototypes which covered:-

- Technology development
- Privacy/GDPR compliance
- Budget spend
- Innovation and commercialization potential
- Testing period progress and milestone updates

This allowed the project team to identify additional information required from each company and confidence that organisational needs were being addressed.

All companies responded to feedback and produced the relevant information to the panel.

Due to a delay in the testing period all companies reviewed their engagement strategy and agreed to work within the new test period.

No variation or amendments have been made to the specification.

4. Indicate how a further phase will take the project towards market readiness including market size and potential customers as well as the current client.

By helping to achieve the goals outlined above companies are developing solutions that will be attractive to cities and organisations across the globe. All of the companies have considered potential commercialisation of their products. Examples at this early stage include:

- potential for **Civic Dollars** rewards system to be incorporated into DAERA MYNI.LIFE summer campaign – discussions under way.
- **iSensing** have already promoted their solution to 40 contacts throughout the UK and are also piloting their solution in Dublin.
- Company strategists at **CIVICA** are already planning to commercialise their product and provide a route to market.
- As a lower cost, less intrusive alternative to CCTV, **SparroWatch** is demonstrating the potential to scale and take a significant percentage of the CCTV market.
- **Pitchbooking** has already a strong foothold in the 'bookings' market for the use of civic facilities and plan to use their existing contacts to promote their new service solution to help address anti-social behaviour and enhance use of civic facilities.

Phase 2 will involve companies further engaging with local government to develop their product features and ascertain the size customer base. It is envisaged that should solutions be deemed viable the potential to deliver in other council areas through the UK and wider afield could lead to potential sales.

Furthermore, the increased knowledge of both the public sector and the SME's around privacy concerns at this early stage has enabled specific measures to be put in place to manage this during Phase 2.

5. Provide an estimate of the amount of funding required for further phase/s. Also indicate the estimated length of phase/s.

It is estimated that funding of £250,000 would be required to support phase 2 which would operate over a 20 month period. This allows for:

- Phase 2 set up and selection – 2 months August/September 2019
- Development phase to embed learning from initial small scale testing at the end of phase 1 (2 to 3 months beginning October 2019)
- Piloting in various sites for a one year period to ensure solutions are tested during various seasons and weather conditions (12 to 14 months from January 2020)
- final analysis and reporting (1 month)

This figure includes a 20% administration and support fee.

It is anticipated that 2 to 3 companies will be supported for phase 2.

This form must be:

(i) signed by
(ii) the lead applicant; and,
(iii) endorsed by a Director or equivalent senior representative from the applicant organisation.

Please include the End of Phase 1 Report and confirm that a further business case is being prepared and will receive the relevant approvals in accordance with your Department's procedures.

Signed [redacted]

Date [redacted]

Lead Applicant Name [redacted]

Position in Organisation HEAD OF CRIME AND COMMUNITY SAFETY BRANCH, COMMUNITY SAFETY DIVISION, DOJ

Endorsed by [redacted]

Position in Organisation DIRECTOR, COMMUNITY SAFETY DIVISION (Acting)

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words '**SBRI Challenge Fund Phase 2 application** in the email subject box. The deadline for applications is **4pm on 29 April 2019.**

SBRI Government challenges Ideas from business Innovative solutions

DfE Department for the Economy www.economy-ni.gov.uk

Small Business Research Initiative (SBRI) Challenge Fund application: Phase 2

Name

[redacted]

Organisation/Department name & address

Business Services Organisation
Operations Directorate
Franklin Street, Belfast.
BT2 8DQ

Email address

[redacted]

Challenge title

Detecting Emerging Traits of Psychosis in Educational and Community CohorTs (DETECT)

CRITERIA

1. Provide evidence of how a further phase of the project will address efficiency/sustainability.

Both projects in phase 2 will

1. Further enhance the accuracy and speed with which neurological diseases can be identified, and treatment efficacy can be tracked.

2. Make it possible to objectively assess brain health and neuropsychiatric function in small clinics and residential settings reducing costs associated with this clinical area.

3. Current solutions for generating datasets of the requisite size are unsuitable due to being either very expensive or designed for limited use by experts. Both solutions after phase 2 will be able to be produced cheaply and utilised by non-experts

4. Offer opportunities to support clinicians in the NHS in the early detection and early intervention of psychosis by providing them with an objective and affordable screening and disease monitoring tool for those with an at risk mental state leading to more potential patients being identified before emergency care is necessary will reduce workload on NHS clinicians

5. Indicate how the technical feasibility was demonstrated at phase 1 – also identify barriers and issues.

One supplier developed an app which was piloted on 8 Doctoral Psychology students who routinely used smartphones; they were asked to use the app for 7 days and complete a usability and acceptability questionnaire. The app functioned and collected the required data appropriately. The students who piloted the app found it easy to use, unobtrusive and highlighted no major concerns. The original aim was to develop an app that would function of both IoS (Apple) and Android phones. However, as Apple phones shutdown all passive apps after 5 minutes; this was not possible. However as android has a market share of 74.5-86.3% for Android phones this was not a barrier to successful development of their project.

The other supplier developed a fully-integrated technological platform which enables both identification of potential patients with an at-risk mental state (who are likely to progress to psychosis) and remote longitudinal monitoring of patients. Their platform is fully portable, and can be used to gather clinical data remotely, even in conditions without good wireless network access. Through consultation with service users, clinicians in the Northern Health and Social Care Trust, and age-representative healthy young adults, they have gathered a substantial body of data which will ensure that the platform is easy to use for patients, and is tailored for the technical needs of clinicians.

6. Indicate how emerging findings from phase 1 give confidence that solutions are progressing satisfactorily to address organisational needs. This may include variations/amendments to phase 1 specification.

The end of Phase 1 reports and end of phase review meetings took place in January 2019 where Clinicians from the Trusts attended and were supportive of both suppliers and their solutions.
Clinicians spoke how they could use the technology and identify young people with mental health issues.
Suppliers showed that the solutions were useful from both the clinical and business perspective.
Clinicians supportive of future development and keen to proceed to field trials.

7. Indicate how a further phase will take the project towards market readiness including market size and potential customers as well as the current client.

Phase 1 findings are of high interest to pharma companies and has expanded the range of conditions that they as companies want to explore. Prior to phase 1 their focus was more heavily on neurodegenerative disease (Alzheimer's and other dementias) whereas now the focus includes psychiatric conditions such as schizophrenia and depression which will be further expanded in phase 2, significantly widening the market opportunity to support drug development.

8. Provide an estimate of the amount of funding required for further phase/s. Also indicate the estimated length of phase/s.

£150,000 total funding split between 2 suppliers, £75,000 each
Phase length – 12 months. Funding requirement for 19/20 - £130,000 (from SBRI Challenge Fund)
Funding requirement for 20/21 - £20,000 (to be the subject of a bid to the 20/21 SBRI Challenge Fund)

This form must be:

(i) signed by
(ii) the lead applicant; and,
(iii) endorsed by a Director or equivalent senior representative from the applicant organisation.

Please include the End of Phase 1 Report and confirm that a further business case is being prepared and will receive the relevant approvals in accordance with your Department's procedures.

A further business case has been prepared and has been approved by BSO.

Signed [redacted]

Date 23/5/19

Lead Applicant Name – [redacted]

Position in Organisation – Interim Head of SBRI

Endorsed by – [redacted]

Position in Organisation – Director of Operations

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words '**SBRI Challenge Fund Phase 2 application** in the email subject box. The deadline for applications is **4pm on 29 April 2019.**

SBRI CHALLENGE FUND APPLICATION 2019/20

Project Title	**PAIN**
Funding sought	**£180,000.00**
Lead Clinician	[redacted]
	Consulted (Y/N) Y
	Content to support (Y/N) Y
Policy officer in HSCB/PHA	[redacted]
	Consulted (Y/N) Y
	Content to support (Y/N) Y
Departmental Policy Lead	
	Consulted (Y/N)
	Content to support (Y/N)
Confirmation from key organisation which will support company that staff resources can be released (required at Director level)	[redacted]

SBRI DoH Business Case 2019/20

1. organisation / department name and address	
Organisation Name & Department	Business Services Organisation Operations Directorate
Address	Franklin Street, Belfast.
Postcode	BT2 8DQ
Contact name in the organisation	
Name	[redacted]
Position	SBRI Executive
Tel. Number	[redacted]
E-mail	[redacted]

Trust/ HSCB/ PHA Contact	
Name	[redacted]
Position	Public Health Consultant
Tel. Number	Tel INT 44 (0) 28 95362883 Mob INT 44 (0) 7717731804
E-mail	[redacted]

2. Challenge Title:

See examples of current & past challenges https://www.gov.uk/government/collections/sbri-the-small-business-research-initiative#sbri-funding-competitions

Project - PAIN

How might we support people living with persistent pain, provide information to aid self-management, improve quality of life and patient outcomes while simultaneously networking and educating practitioners and creating a data source on the profile of patients living with persistent pain in Northern Ireland?

3. Briefly describe the public sector challenge that you would like to overcome? (inc. Policy context, technical and/or operational issues which you are seeking to address)

BUSINESS CASE TOPIC 1a – PROJECT BACK GROUND & STRATEGIC CONTEXT

At least one in five people are affected by persistent pain in Northern Ireland. Many of these want

support to help them with self-management of their condition but cite lack of information and advice as a key barrier to achieving this.[1]

Persistent pain costs between 3 and 10% of GDP.[2] 2 Alongside mental health problems, it is the most common disabling condition and often most troubling for patients.[3] 3 Almost 500,000 people in Northern Ireland are believed to be affected.[4] Numbers are rising due to obesity, multi-morbidity and an ageing population, but information on prevention and good pain management is scarce.

Most people can self manage with GP support and community health care to remain active and well, but many need peer and multidisciplinary support for a good quality of life, and some require pain hospital services, complex treatments and rehabilitation.

From: *Health and Social Care Board and Public Health Agency. Chronic Pain Services in Northern Ireland. A scoping exercise. Belfast, February 2015.*

These are difficult to access, so many rely on prescribed pain medication, contributing to a rising tide of dependency, addiction, expenditure, suffering and death. Many patients lose employment and educational opportunities, friends and family as well as hobbies and social lives.

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[1] Patient and Client Council. The Painful Truth: 2500 people who live with chronic pain tell their story. Belfast: Patient and Client Council, 2014.

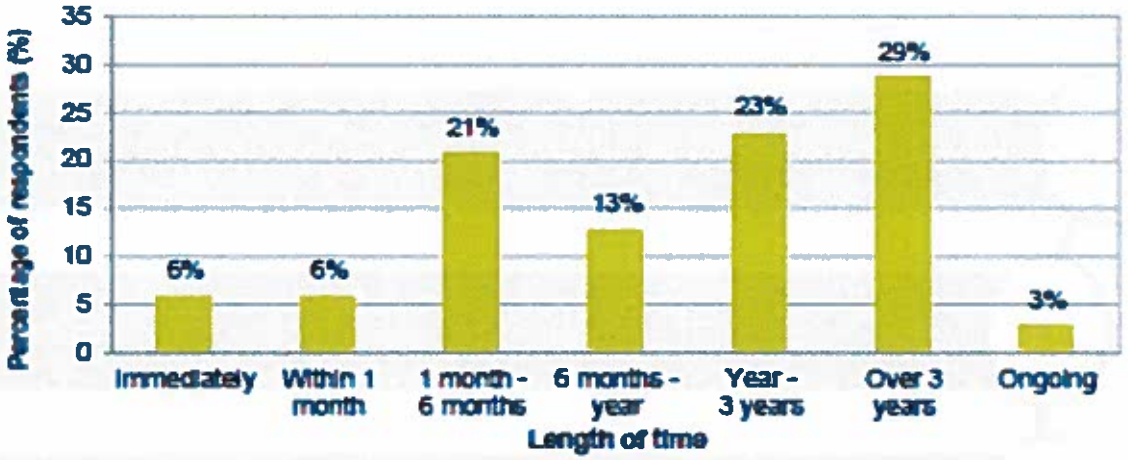
[2] Arthritis Research UK. State of Musculoskeletal Health 2018: Arthritis and other musculoskeletal conditions in numbers. Chesterfield: Arthritis Research UK, 2018.

[3] Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. GBD 2016 Disease and Injury Incidence and Prevalence Collaborators Lancet 2017; 390: 1211–59.

[4] Estimated data for NI based on trends from the English survey: Faculty of Pain Medicine Professional Standards Committee and British Pain Society Council. National Pain Audit 2010-2012. http://www.nationalpainaudit.org/ accessed 13/01/2015.

The Patient Client Council (PCC) published 'The Painful Truth' in 2014 based on a survey of over 2,500 people living with persistent pain in Norther Ireland. This demonstrated dissatisfaction with many aspects of services and helped to improve the understanding of the burden of persistent pain. It showed that many people wait a long time for a diagnosis, which diminishes their chances of recovery.

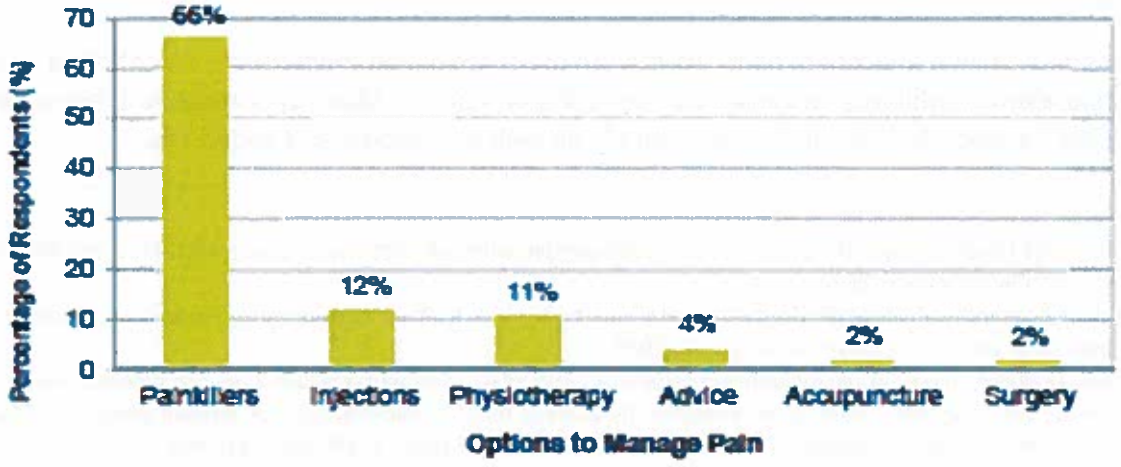
Figure 4: How long did it take to get a diagnosis?



Question asked: How long did it take to get a diagnosis?
Base: 1687

It also confirmed that there is an unhealthy reliance on pain medication in the absence of alternative potentially curative interventions.

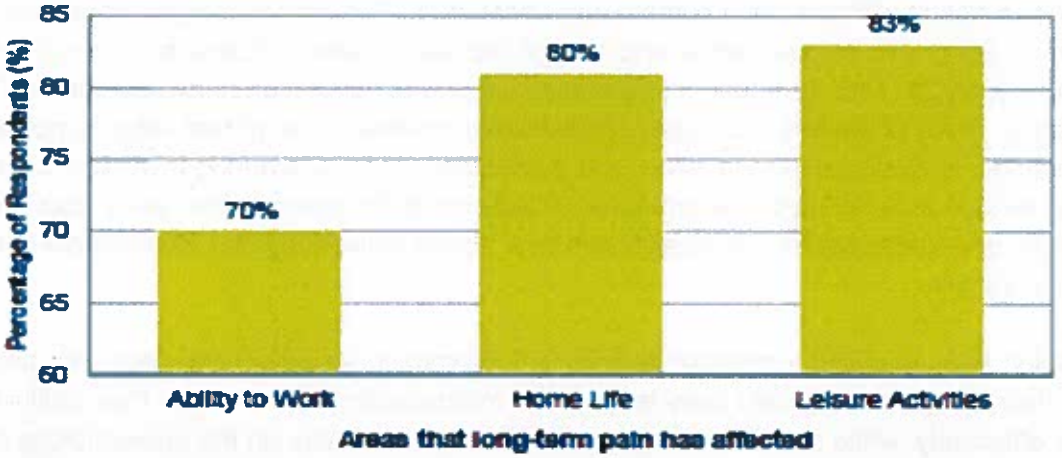
Figure 9: What options were given to you to manage your pain?



Question asked: What options were given to you to manage your pain?
Base: 1556

It helped to dispel the myth that people claim to be in persistent pain so that they may receive benefits. The truth of the matter is that many if not most employed people developing persistent pain sacrifice personal social and family life before giving up work.

Figure 15: How long-term pain has affected respondents



Question asked: Has long-term pain affected the following: your ability to work, your home life, your participation in leisure activities?
Base: 2459 (Multiple response)

The report made 10 recommendations, most of which were endorsed by the then Health Minister:

- PT Rec 2: Develop training and information for HSC providers
- PT Rec 3: Test information sources with service users
- PT Rec 10: Develop resources for service users
- PT Rec 6: Put in place service models based on local population need
- PT Rec 8: Review role of alternative therapies
- PT Rec 5: Embed pain management in Integrated Care Partnerships
- PT Rec 7: Offer a range of pain management care and support programmes
- PT Rec 1: Recognise chronic pain as a long term condtion
- PT Rec 4: Develop a strategic pain services framework focussed on multidisciplinary primary care
- PT Rec 9: Develop an integrated cross departmental Northern Ireland strategy for chronic pain

In response the Public Health Agency (PHA) and Health and Social Care Board (HSCB) established a multidisciplinary cross-sectoral pain forum aimed at improving services for people in Northern Ireland who have persistent pain. One of its four work strands is improvement of information available to people living or working with persistent pain.

Services for persistent pain sit within the Long Term Conditions Framework (see 'Living with Long Term Conditions – A Policy Framework'). Key components of the framework include the development and delivery of quality assured and responsive self-management training, education and rehabilitation programmes and emphasise the importance of good and regularly reviewed information for people with long term conditions through a range of accessible formats including media and technologies.

The PHA in collaboration with the PCC and the Innovation Lab Team at the Department of Finance funded consultation with service providers and users in 2017 to inform a 'digital hackathon'. 45 developers, designers, service users, and service providers came to Queen's University, Belfast on Saturday 3 June 2017 for 12 hours of information exchange, design and development of IT solutions, and judging. Three of the five prototypes pitched were deemed to be of real value to people with persistent pain in Northern Ireland. What was particularly innovative during this hackathon was involving service user and provider groups in all aspects of the process from early user insight workshops, one-to-one patient interviews, surveys, speed networking and involvement in the hackathon judging.

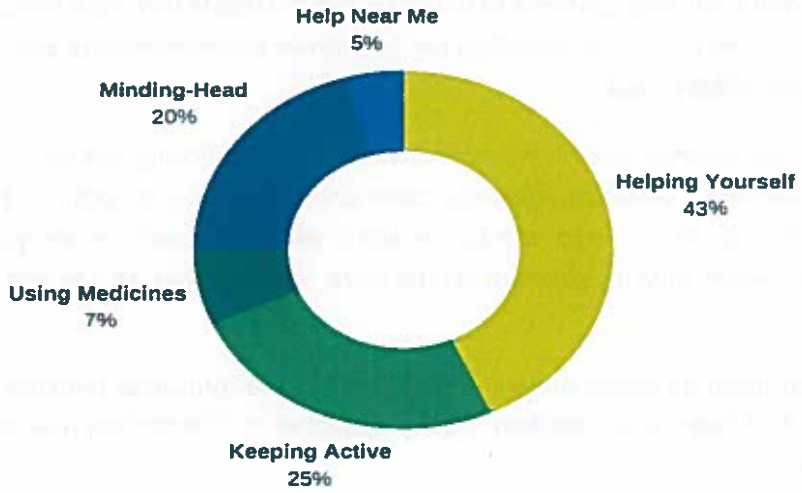
The winning team received a prize for its proposal to produce an application ('app') for patients to monitor their symptoms in a pain diary to aid their understanding and improve their ability to self-manage effectively, while simultaneously creating anonymised data on the epidemiology of persistent pain in Northern Ireland, service provision and accessibility. The original plan was to develop this and useful elements of prototypes developed by other participating teams, but this proved to be unsustainable on a voluntary basis. The coding and development work done to date remains available for reference *(DoF Innovation Lab, personal communication)*.

BUSINESS CASE TOPIC 1b – DEMONSTRATE NEED FOR THE PROJECT

In the interim and in collaboration with the Digital Transformation Team within NIdirect some outputs from the hackathon informed a social media campaign pilot and the MyNI website development in 2018. a new social web platform developed by Digital Transformation Services (Enterprise Shared Services), MyNI, which is user friendly and interactive, can be shared, liked and built upon by service users.

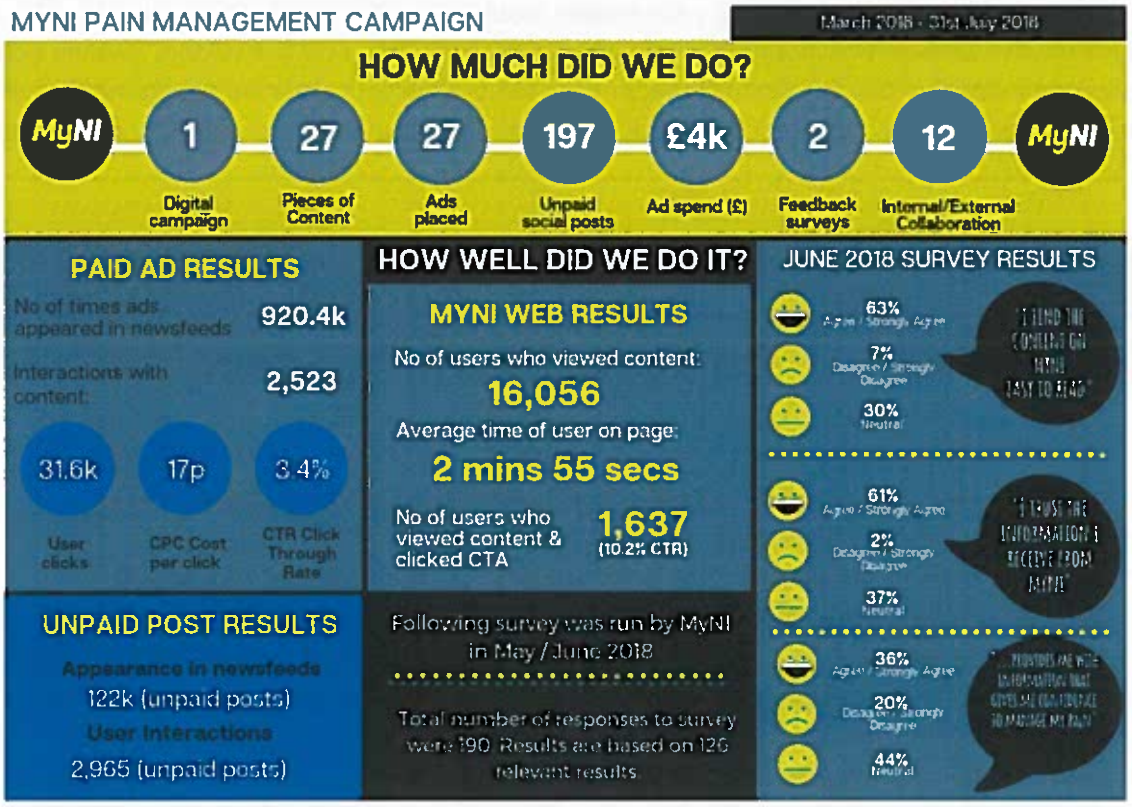
This approach was unique because the status quo for sharing Northern Ireland Government information is "NIDirect" but it does not meet the needs of the persistent pain user group, who need colour, videos and graphics.

Work to date has been overseen by a steering group drawn from the pain forum and governed through PCC, PHA and HSCB. It focussed on responding to patients' information needs that had emerged from the surveys undertaken in preparation of the hackathon, which were developed by patient and professional members of the pain forum into social media outputs across a number of themes.



From: *Patient Client Council: Team Collaboration Is Delivering Results for People Living with Persistent Pain*. Presentation to NI Pain Forum. Antrim, December 2018.

This social media campaign received 18,000 unique page views with a well over industry standards click through rate of 10.2%. Our evaluation survey indicates that 37% of respondents have either tried alternative therapies, connected with others living with pain or started attending support groups.



It confirmed the need for easily accessible, authoritative and coproduce information and resources for people living with persistent pain, but further development, testing and implementation work is needed to realise the vision developed through the hackathon and render it sustainable as well as responsive to changing needs.

"Good to see lots of tips here on coping with pain" and "great website" – **Service user testimonials on twitter**

"This is certainly a resource that I will direct patients to and will keep up to date with your posts. The videos you have on chronic pain are ones we would often use to improve understanding of pain in our clinics." **Physiotherapist in the Belfast Trust**

"This video is brilliant. I have just finished watching it and I am in tears. Very moving and clear and straight to the point. I have just had a physio appointment today and feel there is not going to be much more improvement in my pain and I am going to have to live with it which has made me feel quite angry but after watching the video I understand my condition a little more." **Service User on a recent video posted on MyNI**

The proposed SBRI PAIN is important as whilst previous work has helped formulate thinking and test early ideas it remains the case that there is no solution readily available on the market that will address the presenting problem.

Describe how the project aligns with Programme for Government PfG (including the Industrial Strategy or Public Sector Reform)

This project aligns with the PfG outcome 4- We enjoy long, healthy, active lives. This issues in meeting this objective include helping people when they need support, delivering the best possible outcomes and patient experience. This pain project would allow the one in five in society who are experiencing pain to feel more support in managing their condition and live a long, healthy active life. It is important to note also that 89% of respondents to the draft programme for government consultation felt that this objective was important to include in the final programme for government document.

4. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through adopting innovation

The objectives associated with the delivery of a new solution to support people who suffer from chronic pain will be to:

- Enable those who are suffering from chronic pain, to become connected with the most appropriate modalities of chronic pain management
- Enable chronic pain suffers to effectively access alternative less pharmaceutically intensive and less expensive pain management treatments as appropriate.
- Enable communities of interest to develop and for people with chronic pain to support one another rather than be dependent upon the formal health community
- Enable empowerment through the sharing of knowledge across the carer/ cared for interface.
- Enable the proactive reduction of pain

PROJECT MANAGEMENT OBJECTIVES

PHASE 1

Project Objectives	Measurable Targets
1.Effective management of the SBRI competition so as to receive, evaluate and shortlist applicants to Phase 1 by mid-June 2019	Launch competition by 01:05:2019 12 month contracts to 'go live' no later than 01:07:2019
2. Effective management of the Feasibility Study Phase so as to enable the shortlisted applicants to demonstrate robust solutions meeting the required scope by end June 2020.	Project management team undertake monthly monitoring. Midterm view and end of Phase review with panel and suppliers.
3. Robust governance of expenditure to ensure probity and achievement of value for money in the use of public monies.	Effective management of the project to enable successful applicants to demonstrate that robust solutions can be deployed in the clinical environment by 31:06:2020; with spend only occurring in financial year 2019/20. However, the supplier will have additional 6-months to report upon the detailed research findings once all trial participants have been 'off-boarded'. Of note, the final 6-month reporting period does not attract any costs to the Commissioners.

BUSINESS CASE TOPIC 2b – CONSTRAINTS

PHASE 1

Constraints	Measures to address constraints
1. First Phase of SBRI budget expenditure must be completed by end March 2020 in order to avail of available Challenge Fund monies and that there will be no revenue consequence in 2019/20.	Launch competition within 1 month of award of funding for the business case Phase 1 contracts to be awarded no later than October 2019. Effective management of the project to enable successful applicants to create effective prototype solutions by 31:03:2020.

BUSINESS CASE TOPIC 3 – IDENTIFICATION OF OPTIONS

1. **Do nothing**

The option to maintain the status quo where there is no change in current arrangements.

2. **Procure a solution**

The option to go to the open market with a specified product and directly commission a solution from a supplier.

3. **SBRI**

The option to undertake a pre-commercial procurement to stimulate the market to create innovative solutions to directly address the known service issue & problem.

BUSINESS CASE TOPIC 4 – THE NON-MONETARY BENEFITS OF OPTIONS

1. **Do nothing**

The option will not bring any benefit to the health and social care system; patients will be left isolated without authoritative NI relevant codesigned and coproduced information, resources and signposting to meet their needs at an early stage in the patient journey, when recovery is most likely and participation in voluntary and community provided self management and support groups might suffice to prevent them from developing persistent pain that is much more difficult to manage; services will remain overrun by patients who have been on waiting lists for so long that their needs are difficult and resource intensive to meet if this indeed remains possible; commissioners and policy makers will have to rely on estimations of patient need based on data from elsewhere that might not do justice to the unique circumstances that prevail in NI.

Procure a solution

The option will not bring any benefit to the health and social care system as there are no known solutions on the market to deliver the required change.

2. **SBRI**

The option would bring the following non-monetary benefits:

The Small Business Research Initiative (SBRI) is a mechanism which enables public sector bodies to connect with innovative ideas through the procurement of research and development and allows technology businesses to provide innovative solutions to specific Public Sector challenges and needs. The public sector is able to secure innovative solutions by engaging organisations from different sectors including small and emerging businesses. New technical solutions are created through accelerated technology development, whilst risk is reduced through a phased development programme. SBRI also provides applicants with a transparent competitive and a reliable source of early-stage funding.

The competition is seeking to source new innovative technology solutions to provide a digital platform in the form of a data driven pain patient diary application and a pain management information website which aims to support people in Northern Ireland living with persistent pain by

providing information to aid self-management.

By utilising these data in innovative ways, service providers, commissioners and policy makers could become better informed about actual instead of anecdotally identified or assumed patient population need. Intelligent use of modern technologies and techniques will be explored in this project to link, signpost and nudge people towards changing their behaviours.

This will contribute to prevent and more effectively manage painful long term conditions through healthier lifestyles as people recognise and begin to act on the need to 'Take 5 a day', namely optimise physical and mental health by connecting to and helping others, taking charge of their own health and destiny, being physically as active as possible and eat and drink healthily.

A formative evaluation framework and performance monitoring mechanisms will be shaped and adapted through logic modelling and forms an inbuilt essential requirement of project delivery. The pain forum has agreed a minimum data set for patient outcome evaluation, which is currently being introduced to provide comparable PROMs across all level of service provision and to data, is being used in community and secondary care services. The Faculty of Pain Management and British Pain Society recently published a large suite of validated tools for outcome evaluation of pain interventions. [5]

Work of the pain forum and evidence from research to date indicate that patients and practitioners will change their use of pain medication once alternatives become known, available and accessible. Informed patients and practitioners make better decisions, which, if built on shared understanding, deliver lasting benefit for both, namely more effective use of limited resources, greater productivity, better outcomes and experiences as recognised by the *Institute of Healthcare Improvement's* ***Triple Aim*** *quality improvement methodology.*

BUSINESS CASE TOPIC 7 – PREFERRED OPTION & EXPLANATION FOR SELECTION

The preferred option is **Option 3.**

SBRI recognises that to maintain the status quo is not going to effectively deliver services for the foreseeable future and that there is no readily available solution on the market to purchase through conventional procurement methodologies.

The SBRI programme is a pre-commercial procurement scheme managed under the aegis of Innovate UK. It procures research and development (R&D) for public sector organisations which is necessary primarily because there are often no suitable products or services available on the market.

The key benefits are that SBRI provides a risk-managed environment for the public sector to incentivise the development of new products and services specifically tailored to meet policy and service priorities. At the same time, it helps businesses to get an insight into customer needs, as well as an R&D contract, in order to accelerate their product to market. SBRI is fully compliant with EU procurement and state-aid rules and operates under EU Pre-commercial Procurement Guidelines.

[5] Faculty of Pain Medicine at the Royal College of Anaesthetics and British Pain Society. Outcome Measures. London, January 2019.

5. **Have you researched or are you aware of any commercially available solutions to the problem you are hoping to overcome?**
   If yes, please provide details and explain why these solutions are unsuitable?

BUSINESS CASE SECTION 3 – In support of Options

There are no commercially available solutions that are we are aware of that could suitably meet the needs of patients who live with persistent pain. Although there are apps that are commercially available for pain tracking, there are none that can provide the required system wide and networked analytics. (please see appendix 1 for market research).

Patients frequently cite lack of information and advice as a key barrier to successful self-management of persistent pain and need authoritative locally meaningful sources of information as the social media campaign demonstrated. Many service providers find it equally difficult to source peer reviewed and user evaluated information and support for themselves and their patients.

Service providers intuitively understand the needs of their patients but in the absence of ongoing surveys and needs assessment, which are unsustainable, innovative ways of 'harvesting' data that relate to service user needs and priorities need to be developed and utilised. Service user online activity can provide such intelligence but to date has not been tapped into by public services.

Outputs required will epidemiological information on patient need mapped to existing service availability to inform service transformation and development. They also need to include more sophisticated monitoring and evaluation of online service user activity, impacts and outcomes than we were able to deliver through quantitative and qualitative analysis of social media campaign data.

The governance arrangements put in place for the social media campaign remain in place and will be utilised to guide and quality assure this project.

6. **Please provide an estimate of the amount of funding you require?**

BUSINESS CASE TOPIC 8 – ASSESS AFFORDABILITY. (THE MONETARY COSTS AND BENEFITS OF PART 4)

There is an Innovate UK proven formula depending upon the type of SBRI the proposal requires. For example, the if the proposal is a service redesign or requires a prototyped solution there is a large SBRI project funding structure with maximum bid values and timescales set. Equally, where larger more complex analytics solutions are required or smaller app type solutions there are SBRI digital funding structures as advised by Innovate UK & Department for the Economy. Of note, in the SBRI finding model there are attractive 100% research & development rates offered to multiple successful bidders to enable a competitive and challenging design process. Moreover, a small value of support is also offered to the supporting 'Go-To' Practitioner's team to enable modest amount of backfill.

The total cost of the Phase 1 is £180,000

OVERALL CONTRACT VALUE

PROPOSAL	PHASE	Number of Suppliers	Max Contract Value per supplier	Max Invoice Total Value 2019/20	Max Invoice Value 2020/2021 per supplier
PAIN	1	3	£ 60,000	£180,000	£ 60,000

7. **Have you identified any potential partners or funders you are considering working with?** If yes, identify who they are and explain their possible role and details of any potential financial contributions to your challenge?

There are no further funding opportunities as the proposal was submitted to the GovTech Round 3; the proposal was shortlisted and narrowly missed funding. However, the SBRI has a broad base of partners.

The pain forum has approximately 100 professional and lay members who have informed and overseen the work to date through a steering group supporting by the DoF's Innovation Lab and PHA and HSCB staff.

While the Lab's involvement has come to an end with the conclusion of the social media campaign pilot, HSCB and PHA staff contributing to the development of the HSC portal on NIdirect continue to work with the pain forum.

Collaboration with the University of Ulster (UU) since the hackathon has led to the creation of an associate professorship for the leader of one of the hackathon prototype design teams, whose virtual reality pain management tool is being commercially developed. This in time might become a valuable tool in the growing array of interventions pain patients may access to aid their self care.

UU has also appointed a PhD design student to explore the psychological aspects of persistent pain management and has offered its MSc students to support development of this work during their work experience placements. These have brought new perspectives to the work of the pain forum and can contribute to but not resource the work required.

Members of the winning hackathon team are happy to share their work to date with any incoming company willing and able to take it further.

8. Please indicate the confidence of completing all agreed phases by 31st March 2020, including any work that may have taken place already which may help accelerate the timetable.
9. If the proposal is a Phase 2 project which will require funding support beyond 31 March 2020 please confirm organisational commitment to meet that resource and complete the project.

BUSINESS CASE SECTION 6 – ASSESS RISKS & UNCERTAINTIES.

The Call for Tender and SBRI Phase 1 contracts will ensure the funding will be utilised before 31:03:2020. Equally, the supplier may fail to deliver the solution or underperform and so a strict performance management process has been developed to detect and address issues early holding suppliers to account.

There may be an opportunity for a Phase 2 SBRI and if this is the case a further business case would be developed.

10. Please describe the Project Management arrangements

BUSINESS CASE – Project Management.

BSO

[redacted]

PHA

The host PHA/ Trust(s) within all SBRIs work closely with BSO to support co-creation and as appropriate feasibility testing. The latter is normally led by the Trust's Research & Development Manager and follows strict Research Governance & Ethics protocol.

The BSO Team will move to open market consultation, call for tender, close, assessment and adjudication with assessment of applications being made by the clinical and technical assessors.

The BSO team will undertake monthly monitoring of suppliers and end of Phase reports. BSO team, InvestNI and Department of Health will hold interim reviews and an end of Phase review with suppliers.

SBRI NI's model enables on-site support for suppliers and co-creation without jeopardising the supplier's opportunity to exploit IP will be a key feature and opportunity. The suppliers will be allocated 'Go-To' Practitioners in PHA & HSC Trusts to ensure they are exposed to the environment, issues, technology and complex systems to create prototype solutions with a real potential for success. Moreover, new developments within the NI SBRI Model will be to create the opportunity for functioning solutions to be listed on an R&D Commissioning Framework to enable a faster route to market for suppliers and easier access to innovative solutions for procurers.

MONITORING AND EVALUATION

The project will be monitored by eHealth and EU Funding Unit. A post-project evaluation will be carried out by end June 2020.

Expressions of Interest must be signed by: (i) the Lead Applicant (ii) and, endorsed by a Director or equivalent senior representative from the applicant organisation	
Signed	[redacted]
Date	**11:03:19**
Lead Applicant Name	[redacted]
Position in Organisation	**SBRI Executive**
Endorsed by	[redacted]
Position in Organisation	**Director Operations**

Submission of Business Case Info
Email SBRI BC must be sent to [redacted]

Appendix 1

Market Research for GovTech PAIN Proposal

The aim of this market research is to find technologies that can aid individuals who are suffering from some form of persistent pain and are unaware of how to manage the pain. Research will be conducted in order to analyse what applications or software is currently available to service users which could provide them with pain management techniques, exercise guidance for treatment and keep a log of their pain.

Curable

Description:

A mobile application where users are given a virtual pain coach which simulates an individual talking to the users about their pain and provide scientific information regarding pain and provides the user with exercises and meditation plans to combat persistent pain. The aim of the app is to inform users of the role the brain has in managing persistent pain and how the treatment lessons can be used to reprogram the brain.

Pros:

- Easy to use
- Medical professionals involved in team and app creation
- Testimonials given stating that app has reduced their persistent pain
- App community patient can converse with about pain

Cons:

- Requires monthly subscription
- No options for tracking patients pain on daily/monthly basis
- No involvement from a service user's local medical professionals
- No analytics for analysing patient data

Curable source:
https://www.curablehealth.com/

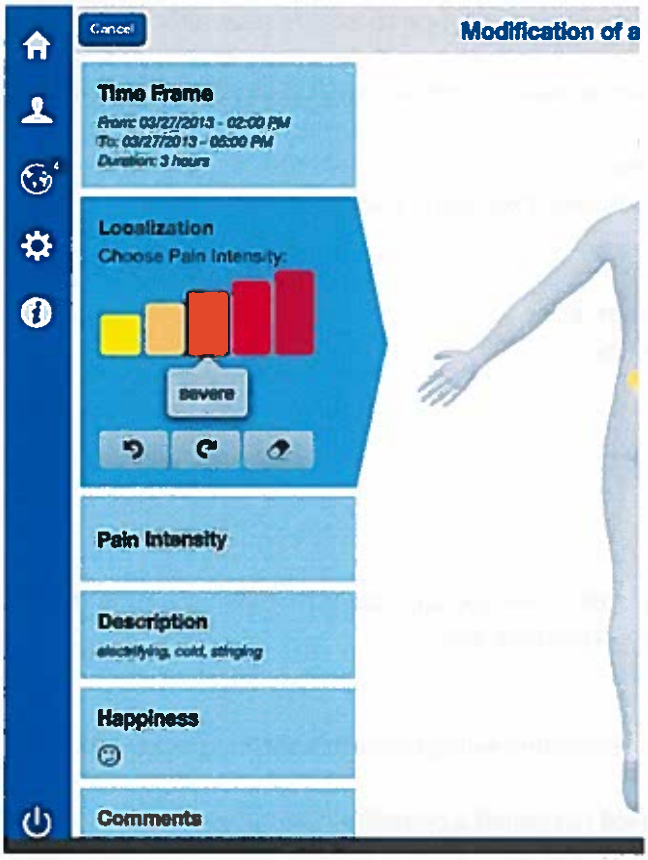
CatchMyPain

Description:

A mobile application that allows patients to identify and track their pain on a 3D model and connect with other users who suffer from a similar persistent pain as well as track their stress, fatigue and mood caused by the pain and converse with their physician regarding this. Medical officials then use the data anonymously from the app to analyse areas to focus on for rehabilitation.

Pros:

- Allows patients to enter details on various days and times and select different settings such as where the pain is, the intensity, mood, their description of the pain etc. (as shown in screenshot below catchmypain.com)



- Integrated weather feature which provides patients with updates on weather conditions near them with plans to integrate analytic charts showing a correlation between the weather and the patients pain
- Medical professionals can request access to the professional version where they can analyse a patients pain records where charts and reports are created through data analytics
- App has community feature where users can see posts by other users with persistent pain and converse with others online to learn more about their pain
- Can be used in app form and desktop form

Cons:

- Extra features such as weather feature costs additional funds
- Medical professionals could be apprehensive to use if they have not heard of the software within their organisation

Catch My Pain source:
https://www.catchmypain.com/

Managing Life

Managing Life is a pain management application that allows a patient to track their pain, analyse their pain through graphs/reports from their records and share their pain with other individuals in similar situations.

Pros:

- Graphs and chart can be created from pain records which can become more detailed the more the patients data is input
- Easy to use slider features to determine level of pain

- Patients and doctors can analyse reports to see if certain exercises/medicines are helping with the persistent pain
- Patients can add their medications to their records and track if this has any effect on their pain
- Majority of report features are free
- Provides notification to medical officials if software analyses a patient may be at risk

Cons:

- Comprehensive reports cost extra to use
- Unavailable to user's with Apple IOS

Managing Life source:
https://www.managinglife.com/

My Pain Diary

My Pain Diary is another application available on mobile app stores that allows a patient to track, recall, analyse and report on their persistent/chronic pain.

Pros:

- Can track over 60 chronic health conditions with parameters such as pain location, type of pain, amount of fatigue etc.
- Colour coated calendar can be used to remind a patient of their pain level on a specific date (as shown in a screenshot from mypaindiary.com below)
- Users can track their medication in relation to pain
- Graphs created from pain records allow patients to compare 3 different metrics per graph
- Reports can be converted to pdf formats to show individuals

Cons:

- Version with more features only available on Apple IOS store
- Pain record entry is less interactive than other pain management apps
- Patients may be put off by paid app

My Pain Diary source:
http://mypaindiary.com/

Live Well with Pain by Dr Frances Cole, Emma Davies and Mrs Eve Jenner

Live Well with Pain is a website created by clinicians for clinicians to provide a number of resources and information for supporting their patients and bettering their self-management of their pain. The website has 5 main sections which are filled with helpful articles for clinicians to read regarding the section topic; the topics available include supporting self-management, shifting the conversation, opioid zone, medicines and your patient as well resources for patients. The website offers a variety of informative media such as website articles, research papers, worksheets, video/audio as well as promotional images/leaflets of which most of can be downloaded from the site. There is also a sister site called My Live Well with Pain which allows users with persistent pain to read, watch, listen and download a number of resources for managing different aspects of persistent pain themselves.

Live Well with Pain source: https://my.livewellwithpain.co.uk/
My Live Well with Pain source: https://livewellwithpain.co.uk/

Pain Toolkit by Pete Moore and Dr Frances Cole

The Pain Toolkit is an alternative to a technology based approach for managing a persistent pain problem which was created by Pete Moore, An author and educator of persistent pain management and Dr Frances Cole, A Pain Rehabilitation Specialist and Cognitive Behavioural. The Pain Toolkit is an informative booklet that provides information on persistent pain and building skills to manage that pain themselves through 12 different tools. Each tool can provide different advice on self-managing pain such as accepting the persistent pain, building a support team, learning relaxation skills, planning your day to account for pain and more. There is also a Pain Toolkit Quiz available online which informs users of the 12 tools and tests their knowledge about them through a quiz to see how informed they are regarding pain management. The Pain Toolkit also provides a number useful website links regarding different types of persistent pain and pain support.

The Pain Toolkit source:
https://www.nhs.uk/Planners/Yourhealth/Documents/The%20pain%20toolkit%20-%20Oct%2010%20-%20READ.pdf

The Pain Toolkit Quiz source:
http://quiz.paintoolkit.org/

Mindfulness Media Online

There is also an extensive amount of media available online regarding mindfulness that individuals suffering from persistent pain can use to relax and attempt to accept living with their persistent pain. Mindfulness is a form of meditation where an individual can focus on breathing and relaxation to gain a mental state that acknowledges and accepts their mental thoughts and bodily sensations. There are a variety of video and audio media available online to individuals for free which can range from relaxing meditation music to a mindfulness coach teaching coping mechanisms and describing mindfulness while performing body movements for relaxation and positive thinking. There is a wide range of video/audio available which can be found on YouTube, Vimeo, Spotify and other media sites.

An example video of mindfulness for pain management by Jon Kabat-Zinn, PHD:
https://www.youtube.com/watch?v=QCNXi_0lsCk

Conclusion

It appears there are a number of pain management software and online resources which uses data analytics in order to create charts which medical professionals can use to analyse trends and correlations with pain and medicine. There are applications available on various marketplaces but I believe more in depth analytics could be performed with more medical metrics used as well possible medical officials providing information through forums/chatrooms as opposed to other non-medical officials.

SBRI Government challenges. Ideas from business. Innovative solutions.

DfE Department for the Economy www.economy-ni.gov.uk

SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

[redacted]

2. Department/Arm's length body name & address

DAERA

3. Contact details

Room 542 Dundonald House, [redacted]

4. Challenge title

- Using satellite imagery and machine learning to automatically detect location of grazing cattle and sheep in Northern Ireland and to monitor habitat change.

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

- DAERA is responsible for animal disease management. Location of grazing animals is important in determining testing strategies and effective control measures in the event of a disease outbreak. Bovine TB levels in Northern Ireland are at near an all-time high. At present, intelligence on the fields likely to have been grazed by animals is based on the association between the registered herd keeper and the fields claimed by the farm business for CAP funding. Not all fields claimed will have had animals grazing on them, but there is no way to know this. There is no information on farm businesses that don't claim CAP funding, other than the address of the herd keeper. This poor information means significant resources are wasted in trying to manage disease outbreaks and particularly in identifying grazing animals contiguous to an outbreak. Technology to automatically determine location of grazing animals (particularly cattle and sheep) would be very beneficial, not only in for disease management, but also in monitoring ammonia emissions. The technology could also be used to monitor habitat change and significantly reduce the need for physical inspections.

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

- Success would be using change detection and automated machine learning techniques on high resolution satellite imagery that could automatically detect the presence of animals down to individual field level (of which there are 870,00 in NI) on a weekly basis as well as monitoring habitat change in these fields. This would dramatically change how animal disease management operates with much better information to target scarce resources. .
- Would it change the way staff work? There would be significantly less need for physical inspections as more work can be done remotely. The improved intelligence would lead to better informed policy making.
- Reduced costs/savings? Significant savings in field staff costs if the technology is successful. Data collection costs would also be significantly reduced.
- Would it change the service you offer to clients? Ultimately this would contribute to reducing levels of animal disease and better environmental controls. Less physical inspections reduces the administrative burden on farmers.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

The project aligns closely with a number of PfG outcomes, most notably with Outcome 1, Outcome 2 and Outcome 5. There are significant costs associated with animal disease which adversely affects competitiveness. Better quality environmental data with a lower cost of data capture will directly support outcome 2 whilst the innovative use of technology will deliver learning that can be used across other sectors (Outcome 5).

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

- Potential partners would be SMEs interested in applying innovative machine learning and automated change detection techniques to detect and map animal presence using HR satellite imagery.
- A number of EU Paying Agencies have been looked at remote sensing techniques for habitat monitoring and are willing to share their experience. I am not aware of it being used to locate farmed animals, certainly not within UK/ROI. If successful, contact will be made with both Universities for specialist advice.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

- Phase 1 would investigate the feasibility of automated change detection/ machine learning using satellite imagery to determine animal location (and density) on a subset of land parcels and over at least three different satellite images. The estimated external costs of this is £50-75k and would be completed within 12 months.
- Phase 2 would extend the most promising application to cover the whole of NI for one grazing season (another 12 months). Estimated £180-200K.
- Phase 3 would extend out to elements of habitat monitoring and would be a further £150k.

Figures are exclusive of VAT. They are based on project costs and exclude the satellite imagery which will be supplied by DAERA.

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name [redacted]

Signed: [redacted]

Position in organisation: Director of Digital Services (G5)

Date 27/03/2019

Endorsed by [redacted]

Position in organisation (at least SCS level) Deputy Secretary (G3)

If relevant, endorsed by Parent Department (SCS level)

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words '**SBRI Challenge Fund Expression of Interest**' in the email subject box. The deadline for applications is **4pm on 5 April 2019.**

SBRI Challenge Fund Expression of Interest

1. organisation / department name and address	
Organisation Name & Department	CCEA Department of Education
Address	29 Clarendon Road, Clarendon Dock, Belfast
Postcode	BT1 3BG
Contact name in the organisation	
Name	[redacted]
Position	Multimedia Learning Resources, Business Manager
Tel. Number	02890 261230
E-mail	[redacted]

2. Challenge Title:
See examples of current & past challenges https://www.gov.uk/government/collections/sbri-the-small-business-research-initiative#sbri-funding-competitions

"Raising Educational Standards at Post Primary – Technology Enhanced Challenge Fund"

– Working Title

3. **Briefly describe the public sector challenge that you would like to overcome? (inc. Policy context, technical and/or operational issues which you are seeking to address)**

(500 words max)

CCEA seeks private sector suppliers in addressing a key educational challenge – the supply of question items for examination and testing systems. Currently educational questions, for testing and examinations, are developed by teachers either in their own school or as part of assessment teams commissioned by CCEA. Whilst this has been a long established and effective way of working, technology provides an opportunity to develop questions in a 'crowd-sourced' manner. Consequently, this would increase available question items for examinations and assessment, increase the quality of questioning in schools and reduce cost.

Such a tool would have global market interest, particularly in subjects that are common across National Curricula. Whilst there are informal online engines to support teachers, there is no tool that provides the level of security and control required for state public examinations.

Therefore, CCEA wishes to engage with suitable private sector technology suppliers to find innovative solutions to this common educational problem. This is in line with the Digital Transformation of Public Services and the objectives of our sponsoring department – DE.

1. Improving the wellbeing of Children and Young People
2. Raising standards for all
3. Closing the performance gap, increasing access and equality
4. Developing the education workforce
5. Improving the learning
6. Transforming the governance and management of education

The focus of this platform would initially be STEM related content.

CCEA is aware that life outcomes often correlate with achievement within mathematics and we wish to strengthen the understanding and engagement with this subject at school level.

The growth of the STEM and ICT sectors is important to the success of the Northern Ireland economy. We want to grow the pool of suitable graduates/trainees/apprentices by increasing engagement with STEM at KS3 especially among females. This will lead to significant economic benefit of retaining and developing a home-grown talent pool and will further support strategies and programme such as Digital Catapult and our IT sector.

We want to aid the teaching profession to support young people by levering the Learning Leaders Strategy and by providing an innovative platform for teachers to integrate teaching, learning, assessment with outcomes, data analysis and automated recommendations engine for personalised learning for young people.

We want to attract further qualified educationalists to input into this process by creating assessment questions/tasks that CCEA will fund on an approved question basis generating a massive bank of educational opportunities.

We want to grow the usage of such a platform across Northern Ireland and we want the data generated to be shared with the teaching profession providing data analytics around item/question performance and student population performance.

We want trend data to be analysed to identified areas of need, concepts that need further support, development of training courses to complete the loop and feed into Assessment for Learning strategies

With mass usage we would like to see trend data shared in an open platform to further stimulate opportunities for private and public-sector investment into support development to continue to raise standards.

In summary:

- Allows a range of authors to contribute assessment ideas
- Provides ways that assessments can be constructed according to individual needs
- Provides granular feedback on performance
- Identifies and supports future learning needs

4. **Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through adopting innovation** (250 words max)

Success would include a technological solution that would accelerate the development of assessment items for STEM and would lead to other educational benefit directly and indirectly:

- 5% growth in STEM related subjects at GCSE.
- Drive uptake of platform by teacher and students to >60% in 3 years.
- Generating a wide range of educational authors
- Creation of large scale question/items banks to simulate growth in Mathematics, STEM and Digital Technologies assessment/qualifications.
- Tagged to criteria and a mechanism for quality assurance/acceptance
- Effective data analysis to feedback on performance which can help inform next steps/learning and teaching.
- Increased efficiencies for examination bodies reducing costs
- Support the Digital Transformation of Public Services initiative.
- Opportunity for significant return on investment for private sector companies across UK and Ireland.
- Greater pool of talent to support our growing ICT sector
- Improved career opportunities for our young people

5. **Have you researched or are you aware of any commercially available solutions to the problem you are hoping to overcome?**
If yes, please provide details and explain why these solutions are unsuitable? (150 words)

While there are numerous virtual learning environments no solution exists at regional level to support the wide range of integrated needs above. Other databases provide centralised data storage of educational records but do not integrate with learning opportunities. No system wide data is available to support the development of targeted materials to improve learning outcomes and raise standards.

Significantly, there is a need for high level security solutions that could support public examination system. Northern Ireland has fast become a provider for technological security solutions and we could lever this potential.

European research in educational technology could also benefit solution providers to lead the field and generate significant return on investment bringing forward integrated innovation in this area.

EC strategic approach to Digital Education:

http://europa.eu/rapid/press-release_IP-18-102_en.htm

6. **Please provide an estimate of the amount of funding you require?**

Approximately £150k for phase 1 and 2 to be completed within 2018-19.

CCEA would commit to funding phase 3 assuming a suitable solution is found and our departmental funding environment remains supportive.

7. **Have you identified any potential partners or funders you are considering working with?**
If yes, identify who they are and explain their possible role and details of any potential financial contributions to your challenge?

C2k – identification of platform compatibility and mainstream integration

Partner schools informing objectives and outcomes as well as testing prototypes and models

Opportunity for the growing number of local cyber security firms to participate in this programme to ensure the confidentiality and security of user data.

European partners for collaboration and sharing of ideas with the potential to generate wider markets for final commercial solution.

8. Please indicate the confidence of completing all agreed phases by 31st March 2019, including any work that may have taken place already which may help accelerate the timetable.
9. If the proposal is a Phase 2 project which will require funding support beyond 31 March 2019 please confirm organisational commitment to meet that resource and complete the project.

CCEA is very comfortable with the timescale for completion of phase 1 and 2 by 31 March 2019 and have considerable experience facilitating complex process with 3rd party suppliers.

Work that will support and accelerate a solution include:

- Development of our Educational Technology strategy will be complete by March 18.
- We have completed our curriculum taxonomy for tagging materials and improving the findability of resources. This will also play an important role in the granular nature of the data analytics components of any solution.
- We will establish working relationships with C2k and schools to aid the programme
- Key educational targets regarding performance in Mathematics have be recorded and analysed
- Leading edge of assessment – processes and control in place as recognised by OECD
- Access to large pool of educational expertise for technology providers

CCEA would commit to funding phase 3 assuming a suitable solution is found and our departmental funding environment remains supportive.

Expressions of Interest must be signed by:

(i) the Lead Applicant
(ii) and, endorsed by a Director or equivalent senior representative from the applicant organisation

Signed	
Date	**17.01.2018**
Lead Applicant Name	[redacted]
Position in Organisation	**Multimedia Business Manager**
Endorsed by	[redacted]
Position in Organisation	**Chief Executive**

Submission of Expressions of Interest

Applications must be submitted via email only and by 29 January 2018. Please ensure that you use the words **'SBRI Challenge Fund Expression of Interest'** in the email subject box. Email applications must be sent to sbri@economy-ni.gov.uk

SBRI Government challenges. Ideas from business. Innovative solutions.

DfE Department for the Economy www.economy-ni.gov.uk

SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

Careers Service

2. Department/Arm's length body name & address

Department for the Economy
39-49 Adelaide Street, Belfast, BT2 8FD

3. Contact details

[redacted]

4. Challenge title

Using interactive technology to enhance the delivery of careers advice and guidance to young people with Autism Spectrum Disorder in Northern Ireland, enabling successful transition into the workplace.

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

The Careers Service would like to explore the potential to introduce interactive technologies to enhance the careers guidance experience for young people with Autism Spectrum Disorder.

Currently, 1 in 34 children in Northern Ireland have a diagnosis of Autism (2018, Prevalence of Autism in School aged children). Statistics also show that only 16% of adults with autism are in full-time, paid employment, despite having some very valuable skills which can be applied in the workplace.

A high proportion of children and young people with ASD struggle to reach their full potential in the education system and world of work as a direct result of their difficulties with social communication and interaction. This can negatively impact their ambition and in turn their long-term personal and economic opportunities.

We know from the young people and parents we work with that access to high quality, relevant careers guidance is critical to ensuring a positive transition from education to employment. Careers advice must be tailored and identify all the possible options open to clients, including the support available.

Much more could and must be done to improve the pathways into work for young people with special educational needs and learning disabilities, including autism. Many have the skills and experience to make a difference in the world of work but very few realise their potential because they simply do not know where their talents can take them.

Social communication and interaction are common difficulties experienced by those with autism. Some pupils struggle to initiate and sustain conversations and many are unable to retain auditory information. Making choices can therefore be challenging. In the context of a careers guidance intervention, pupils with autism can find it difficult to engage/interact with the careers adviser. However, strong visual skills and an aptitude for working with information technology are attributes which, with the introduction of visual/digital technologies, could be used to stimulate conversation and enhance the overall experience.

At present, DfE careers advisers use a series of flash cards to support communication with pupils that have a learning disability. The stimulus pictures look at both the social and occupational worlds of pupil's e.g. swimming, nursing etc. Careers advisers use the pictures during a careers intervention to facilitate discussion and the collection of information which is then used to assist the client in prioritising their career ideas. This resource was developed in 2015 to complement existing practice and to enhance the experience for the young person and careers adviser.

Preparing for Success 2015-2020: A Strategy for Careers Education and Guidance, is a joint strategy between the Department of Education and Department for the Economy. The strategy sets out a range of commitments and actions to ensure young people benefit from a high-quality careers education and guidance system and are ready for the world of work. Good careers education and guidance also makes a significant contribution to social mobility and social justice and helps to eradicate unfairness and disadvantage from our society, to ensure individuals can overcome the barriers which might hinder their progression in education and employment.

A key strand of Preparing for Success, and aligned to this application, is Policy Commitment 2 – E-Delivery. This commitment outlines that access to careers services will be improved through the use of new and innovative delivery channels to allow clients to access services at a time and place that meets their needs, improving customer satisfaction and cost efficiency.

The Careers Service also has Partnership Agreements in place with 98% of post-primary schools in Northern Ireland, including special schools. Having these formal agreements in place ensures we have access to the majority of pupils with ASD in post primary schools and that specific measures are embedded to support learners in the transition process.

As a service we are conscious of the needs and challenges faced by this client group and we are currently represented on the Autism Strategy Regional Multi-Agency Implementation Team (ASRMAIT). We work in partnership with a number of voluntary and community organisations that provide support to clients with autism including: Autism NI (PAPA), Cedar Foundation, Disability Action, The Orchardville Society, The Appleby Trust, Triangle, Sensory Learning Support and MENCAP. The Careers Service also networks extensively with partner organisations and has established links with all five Health Trust Regional Autism co-ordinators to ensure that appropriate referral arrangements are in place and that clients with Autism are aware of and have access to careers services.

As outlined, we now want to explore, through technology, what additional support we can provide to those on the ASD spectrum to ensure they receive the best possible service and ultimately achieve their full potential.

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

By building on the strengths and natural interests of children with ASD, it will be possible to promote career opportunities to assist with their personal and economic independence.

Successful outcomes for this project:

- to help improve the effectiveness of intervention strategies currently deployed to support this group of children and young people to achieve their career aspirations and allow them to make informed decisions on their future career path.
- that clients with ASD are able to articulate clearly using technology what their interests are and how these can be channelled into possible careers sectors or further/higher education and training.
- that Careers Service staff will benefit from having additional technological support that will help them to interact with clients on the ASD spectrum and engage them in the careers process.
- Whilst the use of flash cards has been useful, the introduction of technology will help to further stimulate this client group and allow them to explore other career sectors which they may not have originally thought of as a career. It will also

allow them to realise the transferrable skills and qualities they have and how they can align these with certain careers.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

This projects aligns with the following:

Programme for Government

Outcomes		**Indicators**
3	We have a more equal society	Increase quality of life for people with disabilities
5	We are an innovative, creative society, where people can fulfil their potential. We will contribute to educating and training people, enabling them to develop to their full potential.	Increase quality of life for people with disabilities
6	We have more people working in better jobs	Increase the proportion of people in work
		Reduce economic inactivity
		Increase the proportion of people working in good jobs
8	We care for others and we help those in need	Increase quality of life for people with disabilities
9	We are a shared society that respects diversity	Increase quality of life for people with disabilities
11	We have high quality public services	Increase quality of life for people with disabilities
12	We have created a place where people want to live and work, to visit and invest.	Increase the proportion of people in work
		Reduce economic inactivity
		Increase the proportion of people working in good jobs
		Increase quality of life for people with disabilities

Industrial Strategy (Pillar 2)
Radically reform careers advice on the employment opportunities available both now and in the future.

DfE Business Plan: Strategic Objective 2: Enhance education, skills and employability
Deliver the actions in the Careers Strategy 'Preparing for Success 2015-2020' Action Plan, to support people of all ages to manage their career development and to transition successfully to education, training and employment.

Preparing for Success 2015-2020 – Policy Commitments 2 & 4

2: Access to careers services will be improved through the use of new and innovative delivery channels

4: Access to impartial advice will be maintained and improved, including offering face to face impartial advice to young people at key transition stages, providing additional support to those at risk of becoming disengaged and those with barriers; and providing more advice to parents.

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

Potential partners or funders have yet to be approached for support in this project. There may be scope to work with the Department of Education (DE) as we currently have a joint strategy and a number of commitments and actions within the strategy could be realised through this project.

Depending on progress, collaboration may also be possible with the other three devolved administration careers organisations.

As outlined, we also have partnership working with a number of community and voluntary organisations which may be interested in this work.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

The current project is envisioned as a small SBRI project (phase 1 initially) using digital technology with an estimated budget of £150k. Phase 1 Only' project, 3-4 months, to include market testing, scoping, proving the concept and any technical build. Earliest project work would commence September / October.

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name

Signed [redacted]

Position in organisation: Deputy Principal and Staff Officer Careers E-Delivery

Date: 01/04/2019

Endorsed by: [redacted]

Position in organisation (at least SCS level): Director (Grade 5)

If relevant, endorsed by Parent Department (SCS level):

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words '**SBRI Challenge Fund Expression of Interest**' in the email subject box. The deadline for applications is **4pm on 5 April 2019.**

SBRI Challenge Fund 2017/18 Application

1. Applicant organisation / department name and address	
Organisation Name & Department	Education Authority
Address	40 Academy Street, Belfast
Postcode	T1 2NQ
Contact name in the organisation	
Name	[redacted]
Position	Assistant Director of Transport
Tel. Number	
E-mail	[redacted]

2. Challenge Title: See examples of current & past challenges https://sbri.innovateuk.org/competitions
School Bus Digital Travel Pass

3. Briefly describe the public sector challenge that you would like to overcome? (inc. Policy context, technical and/or operational issues which you are seeking to address) *(500 words max)*
The Education Authority (EA) was established under the Education Act Northern Ireland 2014 and became operational on 01 April 2015. It is a non-departmental body sponsored by the Department of Education. EA is responsible for ensuring that efficient and effective primary and secondary education services are available to meet the needs of children and young people, and support for the provision of efficient and effective youth services. These services were previously delivered by the five Education and Library Boards. Parents have the ultimate responsibility for getting children to and from school safely. However the EA will provide assistance for home to school transport where a child meets certain eligibility criteria. The

Education and Libraries (NI) Order 1986 places a legal responsibility on the EA to provide transport assistance for the purpose of facilitating the attendance of pupils living beyond specified maximum distances from school. Statutory school transport assistance is provided by a variety of means including Translink, EA Bus, private operators & taxis, in compliance with relevant transport legislation and directions/guidelines from the Department. If the EA has seats available on their buses after the needs of all eligible students have been met, concessionary travel may be available for pupils who were not eligible initially. A child may be entitled to free transport to a primary school, post-primary school or Further Education College.

The EA are responsible for determining eligibility, assigning a bus route and communicating with parents the outcome of the application. For pupils assigned an EA bus route, this can include printing a paper based travel pass.

In May 2017, the Education Authority launched a new digital channel offering parents the ability to apply for Home to School transport assistance. This project was delivered in association with the 16x16 Digital Online Transformation program. The Authority has also created a GIS digital network of all EA bus routes, stops and journey information and made this available to parents online.

Approximately 89,000 children are transported to and from school every day in Northern Ireland. Currently to access a bus service, pupils can be required to present a bus pass or the driver must be in possession of a EA supplied pupil loading list.

A new project is proposed to capture patronage data, identify travel patterns and uptake of post primary pupils across different age groups by introducing **School Bus Digital Travel Passes**.

This project will help the Authority provide appropriate travel solutions that meet the educational needs of young people and maximise the financial resources used for school transport.

Benefits to pupils include the confidence in a better customer service, the convenience of a digital bus pass and potential flexibility to avail of a future transport service designed to meet the evolving needs of young people.

4. **Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through adopting innovation** (250 words max)

A successful outcome is continued digital transformation within the Authority to create and issue digital travel passes to young people using school transport. The digital passes are downloadable on mobile devices in a safe and secure manner and are digitally captured at point of entry onto and off the bus. Information is relayed to the Authority in a safe, quick and easy manner for route analysis, fleet planning and transport management purposes.

The value in creating the School Bus Digital Travel Pass is clearly identifiable and measureable for the

EA. Benefits for the EA include:

- Reduce paper usage by providing digital bus passes
- Improving data quality
- Opportunity to streamline and reduce the costs of internal processes
- Aggregation of big data for strategic planning purposes with EA, Department of Education and other departments
- Improved transport planning and fleet management
- Maximising the use of existing transport resources (circa £74 Million) with potential for savings
- Potential source of pupil movement in event of emergency or incident
- Potential to develop, explore and encourage young people beyond school age to avail of public transport in line with Pfg targets.

5. **Have you researched or are you aware of any commercially available solutions to the problem you are hoping to overcome?**
   If yes, please provide details and explain why these solutions are unsuitable? (150 words)

Due to the nature of information being captured (i.e. children's personal data) it is unlikely that any bespoke solution is in existence.

6. **Please provide an estimate of the amount of funding you require?**

£250k estimated.

7. **Have you identified any potential partners or funders you are considering working with?**
   If yes, identify who they are and explain their possible role and details of any potential financial contributions to your challenge?

Not applicable.

8. Please indicate the confidence of completing all agreed phases by 31st March 2018, including any work that may have taken place already which may help accelerate the timetable.
9. If the proposal is a Phase 2 project which will require funding support beyond 31 March 18 please confirm organisational commitment to meet that resource and complete the project .

The Education Authority is committed to continuing digital transformation in line with Northern Ireland Executive in its Programme for Government 2011–15 (PfG) recorded a commitment to increase online access to government services. If funding is available by September 2017, the Authority can confirm that phase 1 proof of concept can be completed by 31 March 2018.

Applications must be signed by:

(i) the Lead Applicant
(ii) and, endorsed by a Director or equivalent senior representative from the applicant organisation

Signed	[redacted]
Date	
Lead Applicant Name	
Position in Organisation	**Assistant Director of Transport**
Endorsed by	[redacted]
Position in Organisation	**Director of Operations & Estates**

Submission of Applications

Applications must be submitted via email only and by 7 June 2017. Please ensure that you use the words **'SBRI Challenge Fund Application'** in the email subject box. Email applications must be sent to sbri@economy-ni.gov.uk

SBRI Government challenges Ideas from business Innovative solutions

DfE Department for the Economy www.economy-ni.gov.uk

SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

[redacted]

2. Department/Arm's length body name & address

Education Psychology Service, Education Authority
Armagh Office, 3 Charlemont Place, The Mall, Armagh BT61 9AX

3. Contact details

[redacted] Principal Educational Psychologist
[redacted]

[redacted] Educational Psychologist
[redacted]

4. Challenge title

Immersive technology as a communication and educational tool for pupils with Autism Spectrum Disorder

Development of innovative solutions using immersive technology to improve education, social, emotional and behavioural outcomes of pupils aged 3-19 with ASD in Northern Ireland

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

Public Sector Challenge

- There are rising numbers of children with autism in schools. These students present with varied and sometimes very significant additional educational needs. More effective and sustainable educational interventions are

required. Research evidence suggests immersive technologies may address their specific areas of need.

Autism Spectrum Disorder

- 1% of the UK population is deemed to meet criteria for a diagnosis of ASD. Rates of diagnosis have increased in recent years; currently 2.9% of the Northern Irish school-aged population has a diagnosis of ASD *(Waugh, 2018)*.

- ASD affects how individuals communicate and interact with others and how they adapt to changing circumstances. The impact of the condition can range from mild to severe. ASD frequently co-occurs with other developmental difficulties, e.g. attention problems, motor coordination problems, learning difficulties and mental health issues. Conversely, some individuals with autism present with areas of marked skill or specialist interest.

Policy Context

- The movement toward educational inclusion places responsibility on policy-makers and schools to make adjustments that enable full participation of children with additional needs. This policy is well-established in legislation (most recently, the Special Educational Needs and Disability Act, 2016).

- The Autism Acts in England (2010) and NI (2011) clarified the duty to implement a cross-departmental strategy for Autism as a distinct category of disability.

- Educational outcomes for people with autism are notable for two key areas of difficulty: reduced attendance and reduced attainment. On average, autistic pupils miss 8 to 13 more days of school, compared to other children; academic attainment is 20 to 40 percentage points lower (*Dillenburger, McKerr & Jordan, 2015*).

- 16% of adults with autism are in full-time employment (The National Autistic Society, 2016).

Technical/ Operational Issues

- Immersive technology is an integration of virtual content with the physical environment in a way that allows the user to engage naturally with the blended reality.

- In a series of small-scale studies immersive technologies have been shown to improve skills of social interaction *(Schmitt, Laffey, Schmidt, Wang & Stichter, 2012), emotional self-regulation (Maskey, Lowry, Rodgers, MacConachie & Parr, 2014) and independent self-care skills (Josman, Ben-Chaim, Friedrich & Weiss, 2008), amongst pupils with ASD.*

<u>References</u>

Josman, N., Ben-Chaim, H., Friedrich, S. & Weiss, P. (2008). Effectiveness of virtual reality for teaching street-crossing skills to children and adolescents with autism. International Journal on Disability and Human Development 7 (1), 49-56

Maskey, M., Lowry, J., Rodgers, J., McConachie, H. & Parr, J.R. (2014). Reducing Specific Phobia/ Fear in Young People with Autism Spectrum Disorders (ASDs) through a Virtual Reality Environment Intervention. PLoS ONE 9 (7): e100374. http://dpi.org/10.1371/journal.pone.0100374

Schmidt, M., Laffey, J.M., Schmidt, C.T., Wang, X. & Stichter, J. (2012) Developing methods for understanding social behaviour in a 3D virtual learning environment. Computers in Human Behavior 28, 405-413.

The National Autistic Society (2016). The autism employment gap: Too much information in the workplace. Retrieved from https://www.autism.org.uk/about/what-is/myths-facts-stats.aspx
Waugh, R., Russell, A. & Blatchford, P. (2016). Maximising

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

A successful outcome from Phase III would be testing at a scale that provides the EA with the confidence that the solution(s) developed can demonstrate positive behavioural, social, or educational outcomes for pupils, and provide an affordability and effective tool for use in the classroom.

Successful Outcome

- A successful outcome would demonstrate improved measurable outcomes for pupils with autism, for example: increased school attendance; increased class attendance; improved attention and engagement in class; reduced anxiety at school; reduced behavioural issues at school; increased interaction with peers; a more favourable attitude toward school; improved attitude toward completing homework; increased independence at school regarding personal organisation and in the longer term, improved academic attainment.

Improved efficiency/ sustainability of public services

- This project aims to result in **low-cost** immersive technology solutions. Low-cost solutions would enable broad uptake of these approaches by the Education Authority and by schools.

- Many of the mental health difficulties experienced by young people with autism emerge subsequent to experiences of heightened stress, negative peer interactions and prolonged social isolation. By improving the educational experiences of pupils with autism, it is hoped that there would be a reduced incidence of mental health difficulties. In turn this would impact on the demands placed on public sector Child and Adolescent Mental Health Services.

Improved academic engagement will help to promote resilience and foster social skills required for later success in employment situations. A key goal of this project is to lay the foundations to ensure long-term economic independence for people with autism.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

This project aligns well with the EA's strategic priorities for the next 10 years, and with the Programme for Government, specifically:

- High quality public services – usage of on line channels to access public services
- Improves life satisfaction scores of people with disabilities

And contribute towards improving the outcomes of children, giving young people the best start in life.

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

Partners

- The Project Board comprises professionals from organisations as follows: the Educational Psychology Service, the Autism Advisory and Intervention Service and the Digital Transformation Team within the Education Authority; the Strategic Investment Board; Department of the Economy, NI; and the Centre for Effective Education, Queen's University Belfast.
- The following schools have taken part in the project to date: Millennium Integrated PS; St Mary's PS Banbridge; St Paul's HS Newry; St Patrick's College, Banbridge; and St Joseph's College, Coalisland.
- Ten additional schools have been approached and have indicated a willingness to take part during further phases of the project.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

- Phase III would require a period of comprehensive testing and evaluation in mainstream schools, specialist classes for pupils with autism and special schools.
- An appropriately powered sample of pupils will be required as well as control groups of pupils.
- The estimate below also includes the capital cost of IT (e.g. Oculus Go and tablets for testing in schools, which would be retained by the EA at the end of the project)
- An estimate of the required cost is £200,000.00 (excluding VAT)

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name

Signed [redacted]

Position in organisation Director - Children & Young People's Servs

Date 26.3.19.

Endorsed by [redacted]

Position in organisation (a

If relevant, endorsed by Parent Department (SCS level)

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words **'SBRI Challenge Fund Expression of Interest'** in the email subject box. The deadline for applications is **4pm on 5 April 2019.**

SBRI Challenge Fund Expression of Interest

1. organisation / department name and address	
Organisation Name & Department	Northern Ireland Audit Office
Address	106 University Street, Belfast
Postcode	BT7 1EU
Contact name in the organisation	
Name	[redacted]
Position	Director/ Audit Manager
Tel. Number	02890251073/ 02890251021
E-mail	[redacted]

2. Challenge Title:
See examples of current & past challenges https://www.gov.uk/government/collections/sbri-the-small-business-research-initiative#sbri-funding-competitions

Using digital analytic techniques in Financial Audit

3. Briefly describe the public sector challenge that you would like to overcome? (inc. Policy context, technical and/or operational issues which you are seeking to address)

(500 words max)

An audit involves obtaining sufficient evidence about the amounts and disclosures in Annual Financial Statements to allow an opinion to be given that there is reasonable assurance that the financial statements are substantially correct and also expenditure does not include any significant fraud or error.

Our audit procedures will include a range of techniques such as:

- Predictive Analytical review – a prediction is made of the expected amount in a cost/income area based on all known information and this is compared to the actual amount. If this is close then some assurance can be taken that the amount is correctly stated; and

- Detailed testing: This is where we would undertake specific detailed tests, on a sample basis, on transactions (e.g. expenditure) and balances (e.g. receivables and payables). We select our samples so that all sampling units have a chance of selection. However, there is always a risk that our conclusion may be different from the conclusion reached if the entire population were subjected to the same audit procedure.

Given that financial accounting records are generated and held electronically there is an opportunity to:

- use automation and artificial intelligence to interpret the data, (while recognising the need for us, as auditors, to retain an understanding of the processes being applied to the data);
- complete basic checks/audit tests on all of the records in a population and to identify anomalies for more detailed testing. This would involve setting criteria for specific accounting populations (e.g. expenditure) and identifying records which do not meet the pre-defined criteria.

For example, when testing expenditure the criteria might include items:

- above a certain threshold;
- that have not received approval;
- recorded outside of normal business hours;
- that have not been matched to a Purchase Order and a Goods Received Note;
- that are duplicates.

Currently, there is no way of obtaining this information without manually setting the criteria on software such as IDEA for each individual data set. Ideally the challenge would be to get to a stage where we could plug data into a piece of software and obtain a list of anomalies at the touch of a button through the use of automation and artificial intelligence techniques.

This would make audit testing more efficient by, reducing the amount of time spent identifying and extracting samples; providing greater audit coverage; and it would enable testing which is focused on potential 'problem areas'.

Audited bodies would benefit from this also through an enhanced level of assurance that audit will identify any potential anomalies in their financial accounting records.

4. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through adopting innovation (250 words max)

A successful outcome might include a piece of software that would allow us to plug in a set of data and, at the touch of a button, receive a report which identifies a complete list of anomalies which failed to meet a range of pre-determined criteria. This solution would potentially make use of automation and artificial intelligence. We would then be in a position to undertake detailed testing on the anomalies identified by the system.

If the system is properly specified and successfully identified a range of anomalies then this solution would benefit ourselves through the application of a more efficient and focused audit approach and would benefit our clients by providing a greater level of assurance over their financial accounting records.

Any solution would potentially be of interest of other public audit agencies in the UK and Ireland including, the Office of the Comptroller and Auditor General, the National Audit Office, Wales Audit Office and Audit Scotland.

5. **Have you researched or are you aware of any commercially available solutions to the problem you are hoping to overcome?**
   If yes, please provide details and explain why these solutions are unsuitable? (150 words)

There is a wide range of data analytics software available to assist in completing audit testing, for example IDEA, Excel, R as well as other data visualisation software such as Tableau. However, based on our own initial research and consultation with other public audit agencies, none of the software is tailored to undertake the testing we would like to complete without a significant amount of work in manually inputting formulas for each data set. We have recently provided our staff with training on IDEA and advanced training on Excel. While this has proved useful, and has enabled us to make better use of excel and IDEA in our audit testing, we are still not in a position to achieve the results that we would like from the software which is available.

6. **Please provide an estimate of the amount of funding you require?**

We would estimate that phase 1 will not exceed £30,000. The work undertaken during phase two would help to determine how much phase 2 is likely to cost however, we would anticipate that the total cost of the project would be within the £100k -£150k range for smaller SBRI projects.

7. **Have you identified any potential partners or funders you are considering working with?**
   If yes, identify who they are and explain their possible role and details of any potential financial contributions to your challenge?

We have employed a consultant from Advanced Analytics Labs to provide advice and assist us in developing a data analytics strategy. The consultant has been engaged, initially, for a period of 45 days between January 2018 and March 2018 at a cost of approximately £30,000. There is an option

to extend this contract for a further 45 days in 2018/19. The SBRI project might assist in the practical development of ideas put forward in the strategy developed by Advanced Analytics Labs.

It is possible that Advanced Analytics Labs will wish to tender for the SBRI project, however we would not have any preconceptions on whether or not we will use them on this project.

8. Please indicate the confidence of completing all agreed phases by 31st March 2019, including any work that may have taken place already which may help accelerate the timetable.
9. If the proposal is a Phase 2 project which will require funding support beyond 31 March 2019 please confirm organisational commitment to meet that resource and complete the project .

We are confident that we can complete all agreed phases by 31 March 2019. We have established an internal data analytics working group. The working group is comprised of eight members of staff from all grades across the Office. It is anticipated that the members of the working group would provide input into the SBRI project and that this would be equivalent to at least one full time member of staff being devoted to the project. We have also employed a data analytics consultant to assist us in developing a data analytics strategy and would anticipate that the consultant would be involved in this work also. The work that he is currently undertaking and due to complete by 31 March 2018 would potentially assist in accelerating the timetable.

Expressions of Interest must be signed by:

(i) the Lead Applicant
(ii) and, endorsed by a Director or equivalent senior representative from the applicant organisation

Signed	[redacted]
Date	**26/01/18**
Lead Applicant Name	[redacted]
Position in Organisation	**Audit Manager**
Endorsed by	[redacted]
Position in Organisation	**Director**

Submission of Expressions of Interest

Applications must be submitted via email only and by 19 January 2018. Please ensure that you use the words **'SBRI Challenge Fund Expression of Interest'** in the email subject box. Email applications must be sent to sbri@economy-ni.gov.uk

SBRI Challenge Fund Application

1. Applicant organisation / department name and address	
Organisation Name & Department	Joint application from: **Land & Property Services**, And **Belfast City Council**,
Address	Lanyon Plaza, 7 Lanyon Place, Town Parks Belfast BT1 3LP City Hall, Belfast BT1 5GS
Postcode	
Contact name in the organisation	
Name	[redacted]
Position	Chief Executive, LPS | Smart City lead (Belfast City Council)
Tel. Number	[redacted]
E-mail	[redacted]

2. Challenge Title:
See examples of current & past challenges https://sbri.innovateuk.org/competitions

Improving the effectiveness in identifying Belfast businesses for non-domestic Rates billing purposes

3. Briefly describe the public sector challenge that you would like to overcome? (inc. Policy context, technical and/or operational issues which you are seeking to address)

(500 words max)

Rates income is an important source of revenue for District Councils (which receive 45% of the revenue) and for the NI Government (which receives 55%). For Belfast City Council non-domestic Rates income constitutes 74% of the organisation's total income and is critical for the delivery of quality services to both residents and businesses.

LPS's role is to identify and collect the Rates in each Council area. For the non-domestic Rate, 'billable' businesses are identified by drawing from a number of organisational data sources including LPS's database; self-reporting by businesses; manual occupancy inspections; and information received from the Building Control service in each Council.

The current process is resource intensive and offers sub-optimal results in terms of accuracy and

timeliness. This is mainly due to the fact that the process occurs within a highly dynamic external environment. Belfast is home to over 16,900 businesses (according to recent Companies House information) with the second highest business 'churn' rate in Northern Ireland. Maintaining accurate records in this context is a significant challenge.

Based on previous occupancy surveys, the mis-identification of 'vacant' business properties is approximately 15% to 20% (with particular problems in identifying those 'billable' businesses located in offices above ground floor level). From previous surveys it has been estimated that the loss of uncollected non-domestic Rates in Belfast is up to £4 million per annum.

The end result is a heavier Rate burden for those businesses and residents that do pay Rates and a reduced income that impacts on the quality of public service delivery.

4. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through adopting innovation (250 words max)

Outcomes from the project:

- ✓ A low cost, integrated data collection methodology for LPS that can dynamically draw on traditional information sources (eg, LPS own records; Council GIS data; Building Control Data, Spatial NI data, etc) and enhance them with data drawn from non-traditional sources including open data. Such data might include utility information, web and social media data, data from third party organisations such as Belfast City Centre Management, satellite information, etc) to create accurate, 'real-time' information on 'billable' businesses in the Belfast City Council area.
- ✓ Reduced data collection costs for both LPS and Belfast City Council – and, as a by-product, greater co-operation and understanding between local and regional government on the merits of SBRI, data sharing and the use of analytical modelling.
- ✓ We would expect the data collection processes and related analytical tools to contribute to development work on a planned suite of city centre management tools (including a Rates Forecasting model and city centre commercial investment support tool).
- ✓ Proven technologies developed by the SBRI would available to other NI councils for adoption. Potentially, any products developed by successful SMEs would also be available to market in other cities and countries.
- ✓ Based on previous occupancy survey work we would expect to see an increase in non-domestic Rate income for both NI Government and the Council.
- ✓ The outcome for businesses include a fairer distribution of the Rate burden across all eligible businesses in the city; and in the longer term, access to a suite of city management tools to support commercial investment decisions.

5. Have you researched or are you aware of any commercially available solutions to the

problem you are hoping to overcome?
If yes, please provide details and explain why these solutions are unsuitable? (150 words)

Worldwide many cities are grappling with a similar problem in identifying businesses for property or Business Rate collection.

There are current proposals before the Greater London Authority from a number of London Boroughs to fund projects to *'maximize rateable income by identifying properties not included on the Valuation Office's rating list or have an allocated rateable value which is understated.'* This problem is different from that described above but solutions are likely to be complementary.

6. Please provide an estimate of the amount of funding you require?

Belfast City Council have begun work with the Future Cities Catapult to determine the scale and scope of the project and have agreed that the use of an SBRI challenge would assure a lower cost, innovative solution.

As part of a larger co-investment agreement to support a 'Smart' Belfast the Council and Catapult have agreed to invest £50,000 in work to support the development of the solution.

Our application to DETI is for £100,000 which would constitute 100% funding for the SBRI element of this work.

7. Have you identified any potential partners or funders you are considering working with?
If yes, identify who they are and explain their possible role and details of any potential financial contributions to your challenge?

Land and Property Service will provide expertise on the systems, processes, legislation and data associated with non-domestic Rate identification and collection.

As noted above Belfast City Council and the Future Cities Catapult wish to invest £50,000 in the particular project. In addition the Council would seek to draw on in-kind support from its Procurement Unit, Economic Development team, its Digital Services and Smart Cities teams, and seek support from our colleagues in Belfast City Centre Management.

The Future Cities Catapult will provide national expertise in supporting SBRI projects; the contribution of in-house data scientists, software developers, and programme management.

8. Please indicate the confidence of completing Phase 1 by 31st March 2017, including any work that may have taken place already which may help accelerate the timetable?
On behalf of Belfast City Council the Future Cities Catapult have begun developing detailed recommendations for the delivery of this project by Quarter Three 2016/2017. Programme management arrangements will be in place from April 2016 to ensure this delivery date.

Applications must be signed by: **(i) the Lead Applicant** **(ii) and, endorsed by a Director or equivalent senior representative from the applicant organisation**	
Signed	
Date	**26 February 2016**
Lead Applicant Name	[redacted]
Position in Organisation	**Grade 7, GI Development**
Endorsed by	[redacted]
Position in Organisation	**Chief Executive, LPS**

Submission of Applications

Applications must be submitted via email only and by 26th February 2016. Please ensure that you use the words '**SBRI Challenge Fund Application**' in the email subject box. Email applications must be sent to sbri@detini.gov.uk

SBRI Challenge Fund Application

1. Applicant organisation / department name and address	
Organisation Name & Department	Tourism Northern Ireland Marketing Division: [redacted]
Address	1 St Anne's Court, Belfast
Postcode	BT1 1NB
Contact name in the organisation	
Name	[redacted]
Position	Visitor Information Manager
Tel. Number	02890 44 1639
E-mail	[redacted]

2. Challenge Title:
See examples of current & past challenges https://sbri.innovateuk.org/competitions

Discover Northern Ireland Real Time

3. Briefly describe the public sector challenge that you would like to overcome? (inc. Policy context, technical and/or operational issues which you are seeking to address)

(500 words max)

Tourism Northern Ireland (TNI) is tasked with marketing Northern Ireland in the island of Ireland and looks after visitor's experience in Northern Ireland. The Stormont Executive has identified Tourism as a growth industry and established a target of £1billion to the economy for 2020. In 2014 Tourism contributed £684 to the Northern Ireland economy. Tourism provides huge growth potential with tourism representing 5.2% of NI gross domestic product and supports 5.4% of jobs in the total workforce. This compares to:

England were tourism contributes 8.8% GDP and represents 9.4% of total jobs; and

Scotland were tourism represents 10.3% GDP and 10.9% of jobs.

Currently empirical data detailing tourism visit and spend is gathered by the Northern Ireland Statistics and Research Agency (NISRA) via exit surveys at airport and ports. In addition, an (telephone) Omnibus Survey is completed in the Republic of Ireland following advertising campaigns. In general survey data is collected ***post*** trip with the analysis being provided some months later. The data collection methodology relies heavily on a visitor's memory and their spend estimation. In addition Tourism Northern Ireland has a range of other disparate data pools including Google Analytics, Falcon Social and Silverpop Email Marketing.

Evidence indicates that a well informed visitor spends more and has a better experience. To ensure customer experiences are the best they can possibly be and that visitor spend is as high as possible, TNI would like to complete a two phase SBRI that:

- Completes a feasibility study identifying the opportunity to integrate consumer data sources enabling real time understanding of tourist's movements, journey, experience and spend in Northern Ireland. The feasibility study will also identify: any additional data and stakeholders available out with Tourism Northern Ireland; and
- Deliver 2 applications. One that integrates the data providing an API to encourage commercial applications plus an application that intelligently engages with tourist's when in Northern Ireland to further build upon the data foundation established.

4. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through adopting innovation (250 words max)

A successful outcome would be:

1. Identification of existing data sets that can be integrated to enable a 360 view of tourists planning, and in destination experience when in Northern Ireland.
2. Securing broad collaboration and committed stakeholders from the public and private sectors.
3. A detailed prototype of integrated data sets providing a foundation to achieve real time analytics.
4. Delivery of a consumer application to intelligently engage visitors in destination enabling push promotions.
4. Data that enables Tourism Northern Ireland and stakeholders to improve promotional targeting.
5. Metrics detailing the economic contribution of visitors.

5. Have you researched or are you aware of any commercially available solutions to the problem you are hoping to overcome?
If yes, please provide details and explain why these solutions are unsuitable? (150 words)

TNI are not aware of a commercially viable solution that achieves the volume of outputs sought and are confident that such a solution does not currently exist. TNI are aware of organisations and products that have sought to integrate tourism databases and or to create real time analytics for a tourism attraction at a local level.

6. Please provide an estimate of the amount of funding you require?

It is estimated that the total amount of funding required is £80,000 with Phase 1 costing £15,000 and Phase 2 £65,000.

7. Have you identified any potential partners or funders you are considering working with? If yes, identify who they are and explain their possible role and details of any potential financial contributions to your challenge?

No other potential partners or funders have been identified.

8. Please indicate the confidence of completing Phase 1 by 31st March 2017, including any work that may have taken place already which may help accelerate the timetable?

Tourism Northern Ireland is very confident that Phase 1 can be completed by 31st March 2017 and that sufficient internal resources will be available to support. Tourism Northern Ireland have successfully completed an SBRI competition in partnership with both DETI and Innovate UK in 2012 for the development of tourism apps. 4 successful applications were brought to the market. Tourism Northern Ireland clearly understands the goal of SBRI procurements and is keen to be recognised as an innovating partner of the DETI family, supporting innovation and growth in Northern Ireland.

Applications must be signed by:

(i) the Lead Applicant
(ii) and, endorsed by a Director or equivalent senior representative from the applicant organisation

Signed	[redacted]
Date	26 February 2016
Lead Applicant Name	[redacted]
Position in Organisation	**Visitor Information Manager**
Endorsed by	[redacted]
Position in Organisation	**Director of Marketing**

Submission of Applications

Applications must be submitted via email only and by 26th February 2016. Please ensure that you use the words **'SBRI Challenge Fund Application'** in the email subject box. Email applications must be sent to sbri@detini.gov.uk

SBRI Government challenges. Ideas from business. Innovative solutions.

DfE Department for the Economy www.economy-ni.gov.uk

SBRI Challenge Fund Expression of Interest – 2019/20

1. Name

[redacted]

2. Department/Arm's length body name & address

Forensic Science Northern Ireland (FSNI)
151 Belfast Road
Carrickfergus
BT38 8PL

3. Contact details

[redacted] Lab Services Director, FSNI
[redacted]
Tel: 02890 361931

4. Challenge title

- The rapid visualisation and identification of body fluids on a range of substrates, within a Forensic science environment.

5. Briefly describe the challenge you would like to overcome
(Include policy context, technical and operational issues which you are seeking to address)

- FSNI's Evidence Recovery Unit (ERU) processes in excess of 6000 items per annum, the majority of which requires the visualisation and identification of 3 main body fluid types i.e. blood (**68%**), semen (**27%**) and saliva/other (**5%**).
- Locating, identifying and further analysing such trace evidence is a slow, painstaking process, requiring skilled staff and is often made more difficult by the colour, pattern and texture of the items being examined, as well as the often very small size of the traces that may be on the item.
- The ERU currently invests **13,000** hours per annum in the visualisation, identification and recovery of body fluids, with many items requiring urgent processing (circa **8 hours**).
- The forensic investigation of serious crimes, such as murder, assault or sexual offences, routinely involves a laborious examination of exhibits, such as items of clothing (from victim

(s) and/or suspect(s) for the presence of "trace evidence" which can help establish the circumstances of the offence, inform the police investigation and ultimately advise the court in a trial. Such evidence can be of very significant importance in supporting exclusions and acquittals as well as convictions.

- FSNI's objective is to reduce the amount of time taken to visualise, identify and recover body fluids from a broad range of substrates in order to maximise throughput, without compromising the quality of service provided.
- In some cases (especially in relation to body fluids), the spatial distribution/pattern of the stain may itself be of evidential importance, e.g. in determining how and in what context the material was deposited on the exhibit.
- The slow speed and high cost of each examination is a limiting factor in the efficiency, effectiveness and speed of forensics in many cases and therefore in the justice system itself.

Potential Approaches:

- Without presuming any specific solution, it is known that different substrates (fabrics, etc.) appear very different under different wavelengths of light (UV, IR, etc.) as do many body fluids and other trace evidence types. Some also fluoresce under certain wavelengths, especially using high intensity tuneable lighting as well as lasers and this is currently used "manually" in several types of forensic examination.
- The technologies exist for multispectral illumination and in other arenas, such as astronomy, they exist for ultrasensitive multispectral analysis.
- Combining these two fields of illumination and multispectral analysis could be used to rapidly scan and screen exhibits and detect the presence and location of traces and identify them chemically/biologically.
- Using AI, and dark rooms, it should be possible to map these traces, together with annotation layers, on digital images of the exhibits. This would greatly speed up the screening out of exhibits of no forensic value as well as identifying and optimising the forensic value of key exhibits.

6. Describe what a successful outcome would look like including the potential for improved efficiency/sustainability of public services through the adoption of innovative new approaches

- Such technology, once validated, would reduce the cost and turnaround times of forensics, widen its use to crimes which are normally too expensive to forensicate and support justice by reducing false negatives and assisting in the delivery of expert witness to the courts.
- It would increase the productivity of a forensic laboratory such as FSNI and reduce the dependency on high numbers of trained staff.
- 13,000 hours per annum is currently attributed to the visualisation, identification and recovery of body fluids from 4000 exhibits. This is a labour intensive process with significant training, mentoring and experience required to produce a competent operative.
- More effective use of technology would increase capacity, as more items could be processed within existing head count
- More responsive service to meet the needs of FSNI's customers and stakeholders, facilitating reduced turnaround times for urgent or prioritised items.
- Product/service costs may be reduced as less staff time will be assigned to the task, which could facilitate future head count reduction or release capacity for innovation purposes.
- In some cases it might be possible to use this technique through the packaging containing an exhibit, without opening it, (by using analytics to subtract the absorption spectra of the packaging material itself) which would be even more beneficial in terms of speed, efficiency and contamination control.
- Deployment of the new solution at the crime scene would enhance sample selection, recovery and interpretation reducing contamination risks and staff time.
- Potential use at the custody suites during the suspect interview stage, with evidence presented to the suspect in order to support an investigatory proposition which may contribute to an early guilty plea.

7. Describe how the project aligns with the PfG (including the Industrial Strategy or Public Sector Reform)

FSNI has direct input an influence on programme for government indicators **7 & 11**:

PFG	Outcome	Measure
7	**We have a safe community where we respect the law, and each other**	**Average time taken to complete criminal cases**
11	**We have high quality public services**	**Quality accreditation maintained and ETS granted**

- Forensic science is instrumental in the provision of scientific evidence, advice, guidance and strategy to key customers and stakeholders such as the PSNI and PPS.

- The ability to provide a timely and proportionate service to the NICJS is essential, with timeliness featuring heavily during recent government/departmental initiatives, such as the Indictable Cases Process (ICP), Early Guilty Plea (EGP) and Proportionate Forensic Reporting (PFR). All projects had considerable input from FSNI ensuring a streamlined approach to the provision of forensic evidence, resulting in a positive impact on the overarching Faster Fairer Justice programme (FFJP).

- FSNI is keen to reduce any delay in the production of forensic evidence, through technology enabled enhancements of existing processes, without compromising the quality and integrity of the service.

- The Evidence Recovery Unit (ERU) is one of the most critical stages in the forensic process as the visualisation, identification and maximising evidence recovery is critical at this point in the process. The objective is to maximise all evidence types from an item e.g. body fluids, DNA, fingerprints, hairs, fibres, gunshot & explosive residue, paint and glass. As these evidence types can co-exist on items FSNI provides joint examinations which involve sequencing the recovery of the evidence types ensuring evidence integrity is maintained whilst optimising the available evidence. This activity is labour intensive requiring highly trained and skilled members of staff to undertake several thousand examinations per year.

- The application, influence and benefits of the latest technological developments has yet to be fully realised within this work stream, with current procedures relying on trained operatives, basic lighting enhancements, magnification and microscopic techniques. Although this process is effective it is not efficient as it requires in excess of 13,000 hours of staff time invested in the recovery process alone.

- The development of an enhanced technology enabled visualisation solution, would enable FSNI to process more items to the same high standard in a more timely and efficient manner, enabling the lab to play its part in reducing the overall timescale from time of offence to court appearance.

- As FSNI is an ISO 17025 accredited laboratory, any new solution/technique will undergo rigorous validation trials, to satisfy the requirement of the Forensic Science Regulator (FSR), United Kingdom Accreditation Service (UKAS) and bring assurance to key customers, stakeholders and courts and reinforce the confidence in FSNI's high quality public service.

- FSNI is committed to the faster fair justice programme and the agency is cognisant of the requirement to generate more capacity, decrease turnaround times whilst maintaining a high quality service for the NICJS.

8. List potential partners or funders you plan to work with during the challenge and indicate if they have been contacted or involved in the submission. Indicate if they are willing to be involved in the project – if so, how

- FSNI routinely engages with several specialist manufacturers and suppliers regarding forensic instrumentation and equipment, in order to address specific operational and technical needs relating to casework.

- Many manufacturers operate in niche/ bespoke areas, however independently cannot meet the requirements and specification required by this project. Early engagement in 2014 with Andor technologies and Foster & Freeman, sought to develop a joint venture with two market leading specialists; however only off the shelf equipment from Foster & Freeman was taken forward to the evaluation phase.

- It is still FSNI's view that the most effective solution will incorporate technology and innovation from a number of specialist providers and we are keen to engage with companies who could potentially develop an effective solution. No approach has been made to any supplier regarding the project brief, however consideration has been given to what specialisms may form part of the final solution:

Table 1

Company Name	Technology	Contacted Y/N
Andor Technologies	Specialist Camera	No
Foster & Freeman	Forensic light sources	No
Coherent	Laser systems	No
ForenteQ	Forensic Light Sources	No
Leeds	Imaging systems	No

- In the event FSNI's bid is successful, the Agency will fully engage with the market place, with primary focus on suppliers/manufacturers that specialise in imaging systems and specialist light sources, however full consideration will be given to alternative technological solutions.

9. Provide an estimate of the amount of funding you require for the entire project. Separate your estimates for what you for what you generally expect to provide during phase 1 prototyping and phase 2/3 development stages. Also, indicate the estimated length of each phase

- From the perspective of market potential, it should be possible in the first instance to size the overall added value to end users (i.e. forensic laboratories) of a solution based on number of exhibits processed versus time saved and improved recovery rates/value of the body fluids mentioned. Such savings could be monetarised as staff savings, increased throughput and/or resources released for other activities such as innovation and R&D.
- A useful first estimate would be a 60% reduction in examination time per exhibit.
- It is conceivable that further non-biological trace evidence types could lend themselves to a similar solution, including fingerprints, paint, glass, fibres and firearms discharge residues.
- FSNI is a significant potential partner for a solution, given our international reputation and membership of international forensic associations such as AFSP and ENFSI.
- It should be possible to gauge the overall market in the developed world's forensic laboratories based on crime rates and populations. Northern Ireland has a relatively low crime rate and a population of 1.8 million.
- It is envisaged this project will be delivered as part of a joint venture between 2 or more specialist manufacturers/suppliers. The final solution may involve the integration of several bespoke technical solutions, in order to meet FSNI's requirement for a fully integrated body fluid screening technique.
- Estimated project funding is based on existing capital spend associated with laser, imaging equipment and high specification cameras.
- Project costs are estimated to be in the region of **200k**
- The project timescale is estimated at **26 months**, however will be subject to change depending on the level of technological integration required.
- Summary of project timescale and estimated phase funding is detailed in table 2 below.

Table 2

Stage	Key activities	Timescale	Estimated cost (£)
Phase1	Establish joint venture Technologies identified Concept feasibility Technical feasibility Commercial viability Proposed solution	Months 1 – 9	60K
Phase 2	Prototype development Prototype testing and evaluation Preferred solution identified	Months 10 – 20	100K
Phase 3	Extended testing Verification exercise Validation Type approval Accreditation	Months 21 - 26	40K
Total		26 Months	200K

Expressions of Interest must be:

(i) signed by the lead applicant;
(ii) endorsed by a Director or equivalent senior representative from the applicant organisation; and,
(iii) endorsed by parent department if applicant is an arm's length body

Lead applicant name

Signed [redacted]

Position in organisation: Laboratory Services Director

Date 3rd April 2019

Endorsed by [redacted]

Position in organisation (CEO, G5)

If relevant, endorsed by Parent Department [redacted] G3, Director of Safer Communities, DoJ (SCS level)

Applications must be submitted via email to sbri@economy-ni.gov.uk Please ensure that you use the words '**SBRI Challenge Fund Expression of Interest**' in the email subject box. The deadline for applications is **4pm on 5 April 2019.**