

Part I. Previous Track Record: EPSRC UK Acoustics Network Plus (UKAN+)

To manage and coordinate UKAN+ we have assembled, through an open call, a team of investigators with a vast range of relevant research experience and connections across acoustics and industry, skills and expertise, direct experience of outreach and public engagement, equality, diversity and inclusion and engaging with government and research councils. The members of this team and their roles are:

Kirill Horoshenkov (Director): Professor of Acoustics at the University of Sheffield. He leads the EPSRC UKAN and is PI or CI on 6 other EPSRC projects including the £7.2M EPSRC Programme Grant (EP/S016813). He played a national role in REF2014, sub-panel 14. In the acoustics community he plays a leading role having been chair of the Research Coordination Committee of the UK's Institute of Acoustics (IoA) between 2011 and 2016. He is Fellow of the IoA and Acoustical Society of America (ASA). He is also a coordinating editor for the Journal of the Acoustical Society of America. Commercially, he is a founder of two successful spin-off companies. He has the proven leadership skills, the academic reputation, experience and understanding of acoustics research landscape internationally to lead UKAN+.

Richard Craster (Deputy-director): Dean of the Faculty of Natural Sciences, Professor of Applied Mathematics, at Imperial College London. He is the co-director of UKAN and has been Co-I or PI on 20 EPSRC grants, including a recent Programme Grant, as well as large-scale European grants such as a FET Open. He is the director of an Imperial- French CNRS international research unit, the highest level of cooperation the CNRS supports. He is very experienced in pulling together academic researchers and industry; in the latter he has had numerous consultancy roles, and sat on or chaired advisory boards to companies, charities and government.

Simone Graetzer (Lead for Early Careers Group): Research Fellow, Acoustics Research Centre, University of Salford. She co-leads the UKAN Early Careers Group. In this role she has organised many, well-received, two and five-day workshops and summer schools and through her leadership there are now 230 early career members of UKAN and this creation of an active engaged Early Career Group has been a notable success of UKAN. It owes much to her drive, enthusiasm and ability. She was on the board of the European Acoustics Association's Young Acousticians Network. She is a member of the UKSpeech Committee, IoA and ASA, from which she received a grant for promising young acousticians. She is funded by the EPSRC grant, Challenges to Revolutionise Hearing Device Processing (EP/S031448/1).

Trevor Cox (Lead for Outreach and Public Engagement): Professor of Acoustical Engineering, University of Salford, past-President of the IoA and past-EPSRC Senior Media Fellow. He is very active in promoting acoustics to the public, with 26 documentaries on BBC Radio, 2 popular science books and articles in New Scientist, National Geographical and the Guardian; he was awarded the ASA science writing award in 2015. He has also run numerous outreach and public engagement projects much of it seeded by funding from the EPSRC. Scientifically, he has been an investigator on 24 EPSRC projects and his work has led to measurement methods in the ISO 17497-2 and the spin-out company CarbonAir that provides spring technology for Audi.

Simon Chandler-Wilde (Lead for Equality, Diversity and Inclusion): Professor of Applied Mathematics at University of Reading and their first Dean for Diversity and Inclusion (in a job-share for the first four years); he co-chaired Athena SWAN Self-Assessment Teams in 2015-16, and 2019, leading to a first Silver Athena SWAN award, and headed-up work on LGBT+ inclusion, leading to Stonewall Top 100 Employer status in 2019, 2020. He was the Dean of the School of Mathematics, Physics and Computer Science at Reading (2010-15). He was a member of the Research Coordination Committee of the IoA. He has a long track record of research in computational acoustics and related funding from the EPSRC.

Philip Nelson (Lead for UKRI and Government Engagement): Professor of Acoustics at the University of Southampton. He brings unique experience to the UKAN+ Network through his previous role as EPSRC Chief Executive and Executive Chair. He was very closely involved in the formation and early development of UKRI and successfully interacted with government at Ministerial level over a period of almost five years. He also has extensive knowledge of the UK HE sector in general and of the acoustics community in particular. This places him extremely well to help those in front-line acoustics research to align their activities with UKRI/EPSRC policy objectives and the needs of the UK Government including the new UKRI initiative on promoting excellence in research.

National Grand Challenge Champions:

Abigail Bristow (Lead for Future of Mobility): Professor, and Head of Department, of Civil and Environmental Engineering at the University of Surrey. She leads the Noise and Soundscape Special Interest Group (SIG) of UKAN (the largest SIG with 400+ members). She is the Chair of the Research Coordination Committee of the IoA, Fellow of the IoA, CIHT and RSA, was a Board Member of the Low Carbon Vehicle

Partnership, member of the Civil and Construction Engineering 2014 REF sub-panel. She is an interdisciplinary member of the Engineering sub-panel for REF 2021.

Antonino Filippone (Deputy-lead for Future of Mobility): Reader in Aerospace Engineering at the University of Manchester. He has expertise in aero-acoustics, aircraft noise, gas turbine engine noise, helicopter and propeller noise and led the EPSRC funded Vertical Lift Network (2015-2018) to channel the national rotorcraft research (academic, industry, government, MoD). This expertise is essential in connecting with the challenges of future urban mobility dominated by rotor systems and high-level integration. He has been investigator on 30 research projects, author of 3 textbooks and over 60 peer-review journal papers.

Stephen Dance (Lead for Healthy Ageing): Professor of Acoustics at London South Bank University with expertise in the areas of architectural acoustics, computer simulation, environment noise, speech intelligibility and hearing conservation. Co-leads of the Communication and Room Acoustics SIG of UKAN. He is the Chair of the Ministry of Housing, Communities and Local Government committee for the review of the Building Regulation Approved Document E, scientific advisor to the London Heliport Consultative Committee, Chair of the Royal Academy of Music Noise Group, founded and run the Royal Opera House Sound Study Group and the International Representative on the Acoustical Society of America Newman Panel. These wide connections will act to ensure engagement of end-users in the challenge.

Christian Sumner (Deputy-lead for Healthy Ageing): Senior lecturer and lead of the Hearing Research Group at Nottingham Trent University, lead for the UKAN Hearing SIG of UKAN and a member of the Hearing Special Interest Committee for the IoA. He holds an honorary position as Associate Professor at the University of Nottingham. He was a Programme Leader at the MRC Institute of Hearing Research. He has experience in a wide range of neuroscience methods: computational models, neural recordings and perceptual experiments in humans and animals, and neuroimaging. He studies the basic functioning of the ear, brain, and the effects of hearing loss. These broad interests are reflected in the range of journals he publishes in: from the Journal of Acoustical Society of America to Proceedings of the National Academy of Science and Journal of Neuroscience. He is ideally placed to strengthen network links with the UK hearing research community, access expertise and encourage collaboration.

Paul Lepper (Lead for Clean Growth): Reader in underwater and bio-acoustics at Loughborough University. Since 2009 he has been PI or CI on 14 UKRI projects funded by both EPSRC and NERC in the area of underwater acoustics and numerous other Government or industry funded projects looking at both sound and noise impact on wildlife both in air and underwater. He is Vice-President International and member of Council for the UK's Institute of Acoustics (IOA) and General Secretary of the Board of the European Acoustical Association (EAA). He has extensive experience in running and delivering project relating to sustainable growth and environmental impact in acoustics spanning nearly 30 years of research work with strong collaborations both nationally and internationally. He has been involved in a wide range of international conference organizations and standards developments.

Olga Umnova (Deputy-lead for Clean Growth): Reader in Acoustics at Salford University. She leads the Physical Acoustics SIG of UKAN. She is also a Co-Chair of COST Action CA 15125 DENORMS (Design for Noise Reducing Materials and Treatments), member of the IoA and Acoustical Society of America. She co-authored 48 journal papers and numerous conference papers related to materials acoustics and its applications. She is an Associate Editor for the Journal of the Acoustical Society of America. She successfully completed several research projects in the field of new acoustic materials funded by EPSRC and industry. She is a founder of a successful spin off company, CarbonAir.

Mark Plumbley (Lead for AI): Professor of Signal Processing in the Centre for Vision, Speech and Signal Processing (CVSSP) at the University of Surrey. He is an expert in detection, analysis and separation of sounds. He founded the data challenge in Detection and Classification of Acoustic Scenes and Events (DCASE). He has published over 350 papers in journals, conferences and books. He was PI on EPSRC Grant Making Sense of Sounds, Co-I on the EPSRC Platform Grant in Audio-Visual Media Research, EPSRC Musical Audio Repurposing Using Source Separation, PI on EU H2020 AudioCommons, and Coordinator of two EC Marie Curie Initial Training Networks (ITNs) (SpaRTaN, MacSeNet). He leads the Communication and Room Acoustics SIG of UKAN.

Alan Hunter (Deputy-lead for AI): Senior Lecturer at the University of Bath and Adjunct Associate Professor (10%) in the Department of Informatics at the University of Oslo, Norway. Prior to joining academia, 5 years ago, he was a Senior Scientist in the defence industry. He is Co-I of the UKRI Centre for Doctoral Training in Artificial Intelligence (£7M) and Deputy Director of the University of Bath's Centre for Autonomous Robotics. He is a member of the Institute of Acoustics, a Senior Member of the IEEE, and Associate Editor for the IEEE Journal of Oceanic Engineering.

Part II. Case for Support: EPSRC UK Acoustics Network Plus (UKAN+)

1. Background and context

In 2017 the EPSRC funded a standard Network grant to create the UK Acoustics Network (UKAN) with the explicit aim of pulling together the formerly disparate and disjointed acoustics community in the UK, across both industry and academia. UKAN has been remarkably successful. It has grown to a membership of over 880 in a very short period of time (almost half of the members are from industry [1]) and 20-50 new members join every month. The network has run over 70 events, including industry-academia engagement workshops, summer schools for early career researchers, specialist and focussed academic-industry topic meetings and annual UKAN-wide events to develop research strategy and identify challenges in acoustics. The Network has also actively engaged internationally with learned societies, i.e., the Acoustical Society of America and European Acoustical Association, and scientific partners such as the French CNRS and German DEGA, to bring opportunities through shared activity. Similarly, partnerships with professional bodies such as the Institute of Acoustics, Association of Acoustics and Noise Consultants, Audio Engineering Society and the Institute of Physics have led to a much wider community engagement and have acted to further draw together and initiate UK activity in acoustics. The main external-facing resource of UKAN is its website [1] which has on average 2000 visits per month. UKAN was not funded to pilot adventurous or translational projects nor has it any funding support for on-going research, joint research with industry, impact or knowledge transfer (KT).

Since its inception, UKAN has also expanded substantially from 9 to 15 Special Interest Groups (SIGs): Acoustic/Ultrasonic Non-Destructive Evaluation (NDE), Aeroacoustics (AA), Acoustic Metamaterials (AM), Acoustic Sensors (AS), Biomedical Acoustics* (BA), Animal Bioacoustics* (ABA), Early Careers Group* (ECG), Communication and Room Acoustics (CRA), Computational Acoustics (CA), Hearing* (H), Mathematical Analysis in Acoustics* (MAA), Noise and Soundscape (NS), Physical Acoustics (PA), Underwater Acoustics (UA) and Vibro-acoustics* (VA). One particular highlight of UKAN has been the emergence of the highly active Early Careers Group (ECG) SIG with over 230 members, which have helped to develop future academic leaders (several have already obtained Fellowships and academic positions due, in part, to our training), run annual summer schools, academia-industry workshops and training events [1] (* indicates new SIGs formed after the launch of the UKAN in November 2017).

In October 2019 UKAN received formal permission from the EPSRC to put together a UKAN+ grant proposal to build on the strengths of UKAN. A call was issued through the UKAN's October 2019 Newsletter [1] for team members and a UKAN-wide event was organised in London on the 1st of November 2019 to provide UKAN members with a forum to discuss the vision of UKAN+. These discussions and reports [2,3] crystallised the vision, ensured that our partners and all members were fully engaged and led to this proposal.

In summary, a key achievement of UKAN has been to bring the UK acoustics research community together and to create a critical mass of expertise visible internationally; this now provides the solid foundation necessary for transformative and collaborative research in acoustics in the UK. The purpose of UKAN+ is therefore to move beyond UKAN, create strategic connections between the Acoustics Challenges and Grand Challenges and to tackle these substantial challenges through pilot studies leading in turn to large-scale grant proposals, systematic research and KT projects involving a wider community. There is a great opportunity for the future of the UK's acoustics related research to move on beyond this point, build upon the assembled critical mass and explore the trans-disciplinary work initiated by UKAN. Therefore, we propose this UKAN+ to take this community to the next stage, connect this Network more widely and contribute through coordinated research to the solution of Grand Challenges set by government. This proposal is actively supported by an overwhelming majority of UKAN members and by a large number of our non-academic partners (*£1M+ of contribution in accompanying letters of support*) that range from the Royal Academy of Music, to the Defence Science and Technology Laboratory and from Natural England to GlaxoSmithKline amongst many others.

UKAN covers all key areas of acoustics and it is now uniquely placed to coordinate UK activity in acoustics related research through UKAN+ paying careful attention to Equality, Diversity and Inclusion (EDI) matters. There is a solid and comprehensive academic-industry membership upon which to build UKAN+; this an accomplishment that has never been achieved before in acoustics by any professional body or research network. Acoustics is an underpinning technology and acoustics related research in the UK spans many disciplines (e.g. [3] and Section 2). UKAN has identified critical Acoustics Challenges which are relevant to all key disciplines [3] and of interest to members of all key professional bodies in the UK. These challenges were mapped onto the 4 Grand Challenges set by the government (Figure 1, [4]) and are to be addressed by the wider community through this proposed UKAN+, which:

- (i) will direct and coordinate proposals and funding including bids for EDI work across community;

- (ii) will grow industry-academic partnerships based on best practice in relation to EDI;
- (iii) will develop new collaborative research and knowledge transfer.

There is a clear need for the community to get access to funding for running high-risk/high-gain pilot studies, which UKAN+ can coordinate and provide to enable the UK to stay internationally leading or competitive. These proof-of-concept studies will be developed into full scale UKRI, ERC and joint industry proposals, which UKAN+ will coordinate to address these challenges with systematic and collaborative research and through knowledge transfer. UKAN+ will continue to build the critical mass visible internationally to enable the UK to flexibly and rapidly address emerging technologies requiring acoustics (see Figure 1 for specific examples).

2. Developing research capacity, impact and national importance

The UK acoustics industry contributes £4.6 billion to the UK economy annually, employing over 16,000 people, each generating over £65,000 in value, in at least 750 companies nationwide. More details on the value of acoustics to the UK's economy is available through the *Acoustics: Sound Economy (Value of Acoustics)* report produced by UKAN in April 2019 [5]. Together with other evidence it demonstrates that harnessing and controlling sound and vibration is essential to modern society. Acoustics makes a significant contribution to markets as diverse as healthcare, defence and construction, yet as an industry it is hidden from view. The 750 firms working in acoustics are distributed throughout the UK with the largest concentration of acoustics industrial activity is in the North West, Scotland and South East regions [5]. The industry is made up of over 98% small and medium-sized enterprises, yet the 7% of medium and large operations generate over 80% of acoustics revenues. Productivity in terms of gross value added (GVA) contribution per employee rises from the £65,000 industry average, to £73,000 in larger companies. Acoustics productivity is similar to that of other enabling technologies in the UK, e.g. photonics industry (GVA £62k per employee in 2014) [5].

Acoustics is a global industry and the UK plays a very significant role in it. Market forecasts are available for those key applications where acoustics contributes to a significant global end-product market. To take just one example, the global market for acoustics materials, which includes products such as sound insulation used in new-build construction and the automotive industry, is estimated at \$10 billion (2016) and is projected to grow to \$16 billion by 2025. The UK is a major player with manufacturers producing traditional sound absorbing materials, such as Saint-Gobain Ecophon, and innovation, through research, has led to next-generation soundproofing metamaterials with smaller companies such as Sonobex emerging. Other markets such as that of ultrasonic equipment is reported to be worth \$7.6 billion (2017), growing at an annual rate of 7.6%. This particular market space is dominated by medical diagnostics products, e.g. hospital ultrasound equipment, and technologies for non-destructive testing and there are substantial UK manufacturers, e.g. EMS Physio, BK Ultrasound and Alba Ultrasound. There are also emerging markets, that are evolving rapidly, and UK acoustics feeds into the potential \$31 billion market for voice recognition and control for the Internet of Things. All major UK industries leverage acoustics expertise with its high indirect environmental and societal value.

In this respect, the role of acoustics related research is vital to the success of UK Plc. At present, the acoustics industry is underpinned by a vibrant knowledge base with over 160 active research grants, worth in total in excess of £160 million and involving over 50 separate UK universities [6]. The value of research grants in acoustics has grown by 49% since 2016. Therefore, there is a strong acoustics research capacity in the UK that needs maintaining and developing. This reflects the importance of innovations in acoustics to the health of other areas of science and engineering. Acoustics is vital to all industries, impacting on the performance and market success of new aeroplanes, manufacturing plants, naval vessels, cars and buildings. These sectors rely on acoustics innovations to keep their products competitive, resilient and compliant with official noise regulations. The profitability and continued employment within several major UK industry sectors relies heavily on the contribution of a far smaller number of experts, directly employed in acoustics.

Research in acoustics is supported by seven different Research Councils under UK Research and Innovation (UKRI), reflecting the multi-disciplinary environment in which acoustics operates, from social and health to engineering sciences. EPSRC funds research in noise control, vibration, underwater acoustics, non-destructive testing, voice control, acoustic building design. BBSRC - mainly bioacoustics and ultrasound. NERC - environmental noise (in the ocean and air), urban soundscapes. MRC - medical ultrasonics, mental health, hearing loss and stress related health effects created by noise. Sound also underpins the music and acoustic technology areas - part of Digital Economy, Global Uncertainties and ICT. These areas of research include music, natural and artificial sounds. Although the EPSRC is the main funder for acoustics related research in the UK (£128M, May 2019) and this Council is an obvious lead funder for this proposal, there are clear trans-disciplinary opportunities for the UKAN+ to tap into the UKRI Strategic Priorities Fund via the EPSRC Science, Engineering and Technology Board (SETB), i.e. "Big Ideas" or "Centres of Excellence". Working

with stakeholders, including the IoA and other learned societies/professional bodies, we will ensure that UKAN+ leads or supports a proposal into any future EPSRC/UKRI “Inclusion Matters” call or similar calls.

Engaging with acoustics research is critical for the UK to maximise its productivity and the benefits to society of technology solutions arising in response to the 4 Grand Challenges [4], whilst also helping to accelerate pathways to commercial adoption and minimise unforeseen impact. Furthermore, modern acoustics will increasingly be the focus of these solutions, rather than an auxiliary consideration in their development. Numerous examples are already emerging to demonstrate the central role of acoustics in addressing the four Grand Challenges through UKAN+, e.g.:

- Active voice-control and AI enables people of all ages to access technology, whether for convenience or for necessity, supporting everything from community care to entertainment.
- Noise has a significant impact on mental health and individual wellbeing. Managing sound will be key to the design and construction of future cities, improving their health and productivity.
- Ultrasonic non-destructive testing is used increasingly in productive digital manufacturing, helping to avoid compromises to quality and safety.
- Sound and vibration management is an integral part of mobility, whether by air, land or sea. Enhancing the travel experience whilst minimising the impact on people, wildlife and the environment relies on passive and active acoustics.
- Acoustics is essential to defence and security, providing new methods and tools which serve both to enable monitoring and detection whilst also facilitating remaining covert.

The proportion of acoustics-related activity within each of these sectors is significant, but when combined across these various industries, the market opportunity is vast and success for exploiting it by the UK Plc relies on the quality of underpinning research in acoustics and in how this research is exploited by the UK Plc. *This message is reflected in a £1M commitment to UKAN+ from our non-academic partners (see letters of support).*

3. Aims and objectives

The aim of UKAN+ is to create strategic connections between the Acoustics Challenges and Grand Challenges and to tackle these challenges, alongside industry, through pilot studies leading to large-scale grant proposals for research projects involving the wider community. The new UKAN+ will take the UKAN community to the next stage with the following objectives:

1. To develop new roadmap for acoustics research in the UK related to Grand Challenges: Clean Growth; Healthy Ageing, Future of Mobility; and AI and Data (see Figure 1).
2. To facilitate explorative (pilot) cross-disciplinary research projects between industry, government, third-sector organisations and academia following on from the agreed roadmap.
3. To use the results from the explorative projects to develop full-scale, high-quality responsive mode applications to the UKRI, and other funders, aligned with the Grand Challenges.
4. To set up a National Centre for Coordination of Acoustics Research (including coordination activities in relation to Equality, Diversity and Inclusion (EDI)) and to achieve full sustainability for UKAN+.

These objectives will be met through specific UKAN+ activities detailed in Section 4. UKAN+ management structure is explained in Section 5, also in the Justification of Resources and Diagrammatic Plan documents.

Grand Challenges	Clean Growth	Healthy Ageing	Future of Mobility	Artificial Intelligence and data
Industrial Strategy Challenge Fund areas	Energy revolution Transforming construction Transforming food production Manufacturing and future materials	Medicines manufacturing Data to early diagnosis and precision medicine Healthy ageing Leading-edge healthcare	Faraday Battery Challenge Extreme robotics National Space Test Facility Stephenson Challenge Driverless cars	Audience of the Future Next-generation services Quantum technology
Enabling fields of acoustics	Non-destructive sonic testing Acoustic metamaterials Sound insulation Acoustics building design	Ultrasound Psychoacoustics Soundscapes Sound and music reproduction Communication acoustics	Environmental management Noise compensation and suppression Electro-acoustics Noise measurement Underwater acoustics / sonar Smart warning signatures	Voice control Active noise suppression Artificial speech Artificial intelligence Sound and music reproduction
Theme Champions	Paul Lepper (lead) Olga Umnova (deputy)	Stephen Dance (lead) Christian Sumner (deputy)	Abigail Bristow (lead) Antonio Filippone (deputy)	Mark Plumbley (lead) Alan Hunter (deputy)

Figure 1: Alignment of acoustic challenges, UK Grand Challenges and Grand Challenges Theme Champions.

4. Specific Network activities

UKAN's main legacy is the 15 SIGs [1] which form a solid foundation for UKAN+. UKAN+ will go beyond the original SIG structure and work under the umbrella of the 4 Grand Challenges led by Grand Challenges Champions and their deputies (see Figure 1). Each of these people is also a leader/co-leader of a UKAN SIG so that the tried and tested SIGs structure will remain the foundation for UKAN+; this will ensure that SIGs work collaboratively towards the 4 Grand Challenges within UKAN+ and to continue networking.

4.1 New Roadmap

The initial task will be to set up the 4 Grand Challenge Research Committees (GCRC) which will develop the roadmap and action plan for acoustics (obj. 1). Each of these GCRCs will cover a particular Grand Challenge Theme and involve representatives from relevant non-academic sectors (also see Section 5). The GCRCs will work with the leaders of the 15 SIGs and their members to ensure that the roadmap reflects accurately all the relevant acoustics challenges and maps them appropriately on the 4 Grand Challenges (see Figure 1 and ref. [3,4]). A key function of this roadmap is to determine and to plan how to add value to research funding and to influence policy through collaboration and information exchange with a wider research community beyond acoustics. The roadmap will expose research active UKAN+ members to industry and society most pressing needs and to allow them to demonstrate wider impact for their research. It will also expose industry and society to rapidly evolving research themes leading to new business opportunities and refinement of the roadmap.

Targets: (i) GCRCs in place by Q1; (ii) consultation workshops run and first roadmap draft is complete by Q2; (iii) roadmap white paper is complete by Q3.

4.2. Explorative/pilot projects

The roadmap will enable UKAN+ to target its funds on those pilot projects which will help to deliver the agreed action plan (obj. 1). As soon as the roadmap and action plan are agreed, UKAN+ will begin to issue bi-annual calls for pilot research projects. These calls will be open to the UKAN+ members and to the wider research community in the UK who can demonstrate that their research proposals are aligned with the agreed action plan. UKAN+ will encourage proposals for pilot projects to come from bi-annual sandpit-style workshops which will help proposals to be aligned with the agreed action plan. The 4 GCRCs will be responsible for the coordination of this activity to encourage cross-SIG collaboration and to ensure that challenges are not being tackled within silos. These workshops will be open to researchers from a wider community beyond UKAN+ to ensure that the proposed acoustics related research contribute clearly to the health of all other areas of science and engineering in the UK and that the UKAN+ takes advantage of any latest developments beyond acoustics. These workshops will examine the potential for collaboration, generate research ideas, stimulate and review proposals, agree on mutual research challenges and novel approaches to outstanding research, industry and societal problems. Some workshops will be arranged with international organisations to widen scope for the UKAN+ operations. The ideas presented at these workshops will be collected, discussed and formed into research and KT proposals. The best ideas will be reviewed by nominated academics, submitted to the relevant GCRC for the award of pilot funding on a competitive basis. The actual process for the submission pilot project ideas and assessment is also detailed in Section 6.

Targets: (i) first sandpit workshop is run by Q2; (ii) collaborations with a wider community are identified and reported by Q3, (iii) first pilot projects are funded and started by Q5; (iv) workshops held with international organisations by Q4 (also see the Project Plan document).

4.3. Development of full-scale grant applications

Selection and funding of top-class pilot research is a key responsibility for UKAN+. Apart from research quality, key criteria for funding a pilot project idea will be: (i) the novelty, significance and capability of their investigator(s) to develop these ideas into competitive full-scale proposals for the UKRI; (ii) the relation of these ideas to the 4 Grand Challenges; and (iii) the potential to develop or maintain an international lead in this area of research. Grant writing retreats will be organised on bi-annual basis with the aim: (i) to review the progress and outcomes of the funded pilot projects; (ii) to select those pilot projects which are at the stage when they can be recommended for the development into full-scale grant proposals for UKRI, ERC or other funders; and (iii) to select and nominate senior UKAN+ volunteer members who can support the development of these bids. Collaboration between different SIGs will be particularly encouraged to avoid building 'research silos' and to encourage trans-disciplinarity. A considerable responsibility for this process will be delegated to the ECG SIG to ensure wide participation of early career researchers and aid their development into future academic leaders. UKAN+ will engage with the UKRI to ensure that these proposals do not miss any relevant managed call and/or go to the right Research Council to maximise their success rate. UKAN+ will also run bi-annual industry engagement workshops at which their members will showcase the results of their research to

the industry and develop knowledge transfer (KT) activities leading to new KT projects and collaborations; we will liaise with Innovate UK and the Knowledge Transfer Networks where appropriate. Another activity of UKAN+ will be to run an annual international fair to attract interest from potential overseas academic/non-academic partners and funding to support these types of collaboration. In all these activities we will be proactive in monitoring and encouraging diversity of participants.

Targets: (i) first grant writing retreat is organised by Q4; (ii) first full-scale proposal is submitted to UKRI by Q6; (iii) first new academia-industry collaborations are set up by Q6, (iii) reports at relevant international conferences by Q6; (iv) evidence of interaction with relevant organisations posted on website by Q8; (v) a long-term Network strategy for public and government engagement by Q10.

4.4 National Centre for Coordination of Acoustics Research and sustaining UKAN+

The development of a National Centre for the Coordination of Acoustics Research and sustaining UKAN+ for the long-term is the most ambitious objective of this grant application. Firstly, we will work with the professional bodies, especially the IoA (see their letter of support) to move forward together in jointly facilitating research activity to set up a National Centre for Coordination of Acoustics Research which can become self-sustaining under the auspices of the IoA after the end of UKAN+. This Centre is likely to incorporate the Research Coordination Committee for Acoustics which is currently run by the IoA. The IoA has ambitious plans to increase the proportion of its research-active members and it is an ideal umbrella for such a National Centre. Secondly, UKAN+ will provide a clear internal and external identity or ‘brand’ for UKAN+ research members who are also members of various key professional bodies in the UK other than the IoA. With such a large critical mass UKAN+ will be well placed to work with the UKRI/EPSC to support the review of the current funding research landscape in acoustics and to promote excellence in research in the UK through large scale investments which UKRI/EPSC are planning to make [7], e.g.: (i) New Horizons; (ii) Centres of Excellence; (iii) Institutes. Thirdly, UKAN+ will be open to the wider community to pursue specific research challenges through the development of a nascent Centre for Doctoral Training (CDT) cohort of co-funded PhD/EngD students (see letters of support). There is currently no CDT in acoustics and this will be a good opportunity for the UKAN+ to begin to develop one with support from its members and partners. This nascent CDT will build upon the excellent work of UKAN in providing training opportunities and networking for early career researchers and strong support within UKAN+ for the ECG SIG. This will require collaboration between non-academic partners and academic institutions to fully co-fund PhD students and for UKAN+ to provide support and training through ECG activities, e.g. free access to UKAN+ events, bespoke mentoring and training without further costs to the UKRI. This opportunity will be open to any non-academic partner who wishes to engage with UKAN+ to address the skills gap identified by partners or to solve a problem that requires research. Some of our partners have already agreed to support this initiative (see letters of support). UKAN+ will build and support a cohort, strengthen non-academic links and develop a brand around its name to contribute to the future of the National Centre and to leverage more non-UKRI funding and provide coordination for matters related to EDI through evidence developed on the EPSC Inclusion Matters projects. Targets: (i) IoA/UKAN-led National Centre is set up by Q4; (ii) EDI action-plan developed by Q6; (iii) New Horizon proposal is submitted to UKRI by Q4; (iv) first PhD projects are set up by Q6.

5. Membership and Management structure

The effective management of a Network that will, at current growth, soon reach over a thousand members is a challenge. The new SIGs range in size from 10 to 50 members and are likely to grow substantially; the majority of the established SIGs are 100-300 members strong [1] and these groups need to work collaboratively to address the 4 Grand Challenges effectively. Therefore, 4 Grand Challenges Champions and their 4 deputies will be appointed to manage and direct this process being the foundation for oversight and strategic decision making. An Executive Board (EB) will be formed for quick decision making and strategic planning. The management structure of UKAN+ and interactions between its elements are shown in Figure 2.

At present, the SIGs are responsible for running UKAN activities, such as workshops, training, building their community and interacting with other SIGs. This process will be overseen by the 4 Grand Challenges Champions in UKAN+ and each SIG will have a lead, co-lead, an early career member and a local management structure. UKAN+ SIGs will have devolved budgets and report to the EB every 6 months. SIGs’ activity will be evaluated at the UKAN+ Annual Assembly (see Figure 2) and feedback or support will be given if required. The SIGs are bottom-up, community-led, responsive and flexible to respond to evolving research challenges.

The substantial step-change proposed in UKAN+, to take the acoustics community forward, is the use of 4 Grand Challenge Themes (see Figure 1), aligned with those of the UKRI, designed to take advantage of these active SIGs to coordinate the acoustics community for large-scale grant proposals, the Industrial Strategy

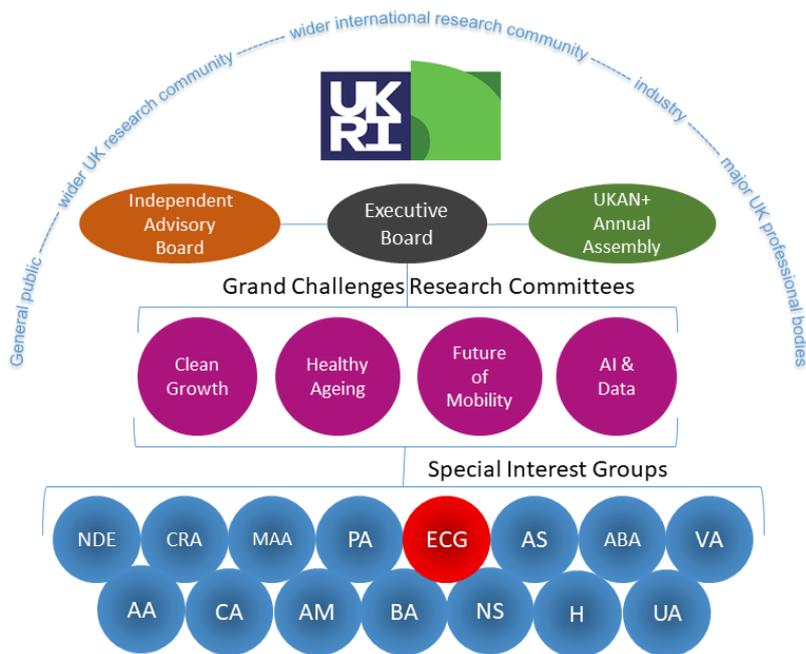


Figure 2. UKAN+ management structure and key elements (see page 3 in the case for support for keys to the abbreviations).

Challenge Fund, and interfacing with industry partners. The 4 Grand Challenges Champions will work across the 15 SIGs and take responsibility for developing and updating the new roadmap for acoustics related research in the UK with agreed action plan, clear milestones and realistic timetable within the proposed duration of UKAN+ grant. The 4 GCRCs will play a key role in the UKAN+ as they will be responsible for the competitive managed calls from UKAN+ and for selecting pilot projects for possible funding. The process for approving funding for the pilot projects, academic/non-academic secondments, mobility grants and other activities will be open and transparent. When a call closes, each GCRC will rank proposals in their Theme, and recommend their

funding level, or give feedback to improve the proposal for subsequent rounds. The EB will then release funding from the Flexible Fund (see JeS form) and rebalance it across themes if needed (see also JoR).

The leaders of the GCRCs and SIGs, EB and nominated industry members will meet six-monthly. The role of these meetings will be to provide an open forum for reporting on funding allocation, coordination point for wider community and public engagement activities, and to ensure that silos do not form and that UKAN+ priorities are properly communicated and acted upon. The day-to-day running of the Network will be delegated to the EB that will meet monthly. The EB will consist of the director, co-director, four co-opted industry members, four Champions of the Grand Challenge Themes and Network Manager. In order to benchmark the UKAN+ activities internationally, obtain constructive feedback upon our priorities and to achieve the set objectives we will have an Independent Advisory Board (IAB) consisting of international high-profile academics and industry advocates, representative of the 4 Grand Challenge Themes. This IAB will meet annually, a day before the UKAN+ Annual Assembly. The IAB will have two members drawn from the professional bodies associated with acoustics to ensure wider engagement (see JeS form or JoR for proposed names). The EB will report to the IAB and Annual Assembly. The Early Careers Group is different from the research SIGs (red circle in Figure 2). This SIG focuses on developing of future leaders in acoustics - a natural aim of the UKAN+. The ECG also identifies members suitable for mentorship in Fellowship proposals. It will have its own management structure mirroring that of the UKAN+: a small Executive Board and 4 Grand Challenges Champions. It will report directly to the UKAN+ Annual Assembly and have representation on the EB. An ECG member will be on the leadership group of every SIG in the Network.

6. References

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