1 Interview synthesis report

1.1 Introduction

This synthesis report summarises the findings from 51 semi-structured interviews (Table 1) conducted by Technopolis as part of a landscape review of bioimaging commissioned by Wellcome. The interviews were either scoping interviews conducted at the beginning of the landscape review or stakeholder interviews conducted as part of the main data collection. The interviews explored the views of a range of stakeholders with a view to complement gaps in the data gathered by the desk research and survey, and to deepen our understanding of nascent technologies/methodologies and their added benefits, the barriers affecting progress in the field of bioimaging in both High-Income Countries (HICs) and Low/Middle-Income Countries (LMICs) and potential interventions to mitigate the barriers and/or to support breakthrough and game-changing work in the field.

Table 1 Number of stakeholder interviews conducted by country type and gender

Country type / gender	Scoping interviews	Stakeholder interviews	Total interviews
High-income countries	10	29	39
Males	3	17	20
Females	7	12	19
Low- and middle-income countries	3	9	12
Males	1	7	8
Females	2	2	4
Total	13	38	51

Our interview sample was concentrated on technology/methodology developers rather than users. Diversity in terms of geography, gender, discipline/sector and technology was also considered in the sample frame. For country types (HICs vs LMICs) and gender, a 50% target was desired within the sample. While this was almost met for geographical distribution in the initial longlist, the gender target was not met owing to the existing gender bias in the field especially in terms of technology/methodology developers in LMICs. Unfortunately, despite a relatively balanced sample frame at the start, our targets could not be fully met owing to lack of availability of proposed interviewees and difficulty in finding like-for-like replacements. Therefore, ultimately our interview sample consisted of 45% women and 24% LMIC respondents (Table 1).

Overall, 12% (n = 6) of the interviewees were experienced in whole-body imaging techniques like MRI and 16% (n = 8) of the interviewees were associated with computational imaging and data analysis and management. The remaining interviewees (72%, n = 37) were facility managers and researchers predominantly working with different microscopy techniques. There are two reasons for this skew. Firstly, at larger scales of life (e.g. organism level), use of imaging techniques is often biased towards answering clinical research questions such as those related to diagnosis or therapeutics, and discovery research application can be limited. Moreover, there is a greater variety of technologies and methods at the lower scale with applications in

many different research areas and recent developments, which also needed to be represented in the sample.

1.2 Developments in bioimaging technologies and methodologies

Interviewees from our scoping and stakeholder consultations broadly agreed on two main areas in which the next generation of bioimaging approaches will emerge – first, **correlative and multimodal imaging** and second, **use of artificial intelligence (AI) techniques** in image acquisition and analysis. Developments in both these areas are expected to contribute to the transformation of the field of bioimaging, rather than a breakthrough in a single nascent technique alone.

1.2.1 Correlative and multimodal approaches

The integration of diverse techniques and methodologies across the scales of life will enable the formulation of new hypotheses and breakthroughs in our understanding of biology that could not be answered using a single imaging modality. For example, application of **correlative light and electron microscopy (CLEM)** was cited as being transformative for the area of intracellular organelle localisation. However, stakeholders noted multimodal and correlative imaging pipelines need to be further developed and standardised before they can be used in routine practice.

In the area of structural biology, multimodal pipelines spanning three orders of magnitude (**super-resolution microscopy [SRM]**, focused ion beam [FIB] milling and cryogenic electron microscopy [Cryo-EM]) are being developed to solve protein structures in their native environment. Other examples of imaging modalities being integrated included CLEM with volume electron microscopy (Volume EM); CLEM with array tomography; electron imaging, X-ray imaging and Cryo-EM; spectroscopy and single molecule microscopy; X-ray tomography with SRM; magnetic resonance imaging (MRI), computed tomography (CT) and light sheet microscopy; MOSAIC (Multimodal Optical Scope with Adaptive Imaging Correction), FLIM (Fluorescence lifetime imaging) and spectrometry.

Stakeholders also reported that advances in correlating data from other fields (e.g. transcriptomics and proteomics) with data from different imaging modalities (including correlative/multimodal techniques) are transforming the field of bioimaging by enabling cellular activity to be viewed/measured in the spatial context. However, standardised protocols to combine data sets are not readily available for all fields.

1.2.2 AI-based approaches

AI-based techniques (e.g. machine learning, deep learning) are expected to play a big role in supporting analysis, linkage of large datasets, real-time image acquisition of relevant images as well as pushing bioimaging techniques forward. For example, AI-based methods have increased the efficiency of cell segmentation analysis at a scale that was not possible before.

1.2.3 Other techniques and approaches

Other techniques mentioned by interviewees as being potentially transformative for bioimaging and biological research are described below.

Advances in **SRM techniques** are transforming the field of bioimaging by enabling the study of cellular mechanisms in different contexts at high resolution, which was not achievable with previous techniques. The impact of SRM techniques on the bioimaging community is rapidly expanding as commercial SRM microscopes become available, yet some SRM techniques e.g. minimal photon fluxes (MINFLUX) microscopes are yet to be taken up widely.

Light sheet microscopy is an emerging area being rapidly expanded to generate modified versions (e.g. lattice light sheet) that are enabling faster real-time imaging. Commercialisation of lattice light sheet is improving the availability of this technique; however further developments are needed to apply commercially available versions to a wider range of samples. **Volume EM** is another emerging area that is expected to be in high demand as it can image 'large' volumes at high resolution. Even so, the need for very specialised and costly equipment puts volume EM out of reach for anyone other than large HIC-based facilities with plenty of resources. Furthermore, advances in techniques such as DNA-PAINT molecules that can enable the multiplexing of over 20 signals with low-background at high resolution are expected to maximise biological insights derived from imaging modalities.

Photon counting is an emerging CT technique that is transforming cardiovascular research. This technique can overcome the challenge of 'calcium blooming artefacts' that distort images and prevent prediction of heart attacks. Other emerging techniques improving CT include spectral CT and radiomics.

Advances in **MRI** scanners with ultra-high magnetic resonance (e.g. 7 Tesla MRI), magnetoencephalography (MEG) and optogenetic functional magnetic resonance imaging (fMRI) are showing promise in terms of better elucidation of brain function and structure. In contrast, development of cheaper and portable ultra-low field MRI technology is expected to democratise the technique, especially in LMICs, by making equipment more affordable and easier to use.

While **single cell imaging** could transform research in antimicrobial resistance and cancer drug resistance, technological developments (e.g. microfluidics devices) are needed to enable isolation of resistant cells for subsequent genomic analysis.

Other emerging imaging technologies and methodologies cited by stakeholders as being potentially transformative included magnetic particle imaging, magnetic resonance spectroscopy, mesoscale imaging, ultrasound imaging, photoacoustic imaging, wavefront sensors, nanoscale secondary ion mass spectrometry, mass photometry, quantitative label-free or phased imaging, three-photon microscopy, second-harmonic generation microscopy, adaptive optics, Brillouin microscopy, multiplex tissue imaging, non-hydrogen MRI (sodium and deuterium), *in situ* tomography and diffusion weighted spectroscopy.

1.3 Challenges and barriers in bioimaging

1.3.1 Scientific or technological barriers and challenges

Sample preparation is a major bottleneck limiting application of bioimaging techniques according to many of the scientists consulted in our scoping and stakeholder interviews. For example, there is a lack of standardised protocols for sample preparation of pathogenic organisms. In the EM field, sample preparation in general requires a lot of optimisation and specialised expertise, which often needs to be provided by core EM facilities or labs. Stakeholders also reported the application of single-molecule localisation microscopy and Cryo-EM is limited as sample preparation protocols are not optimised.

In the context of **SMR techniques**, improvements are needed to a) allow larger samples to be imaged, b) allow imaging of native unstained biological samples and c) increase temporal resolution to capture cellular events in fast timescales e.g. 'DNA base flipping' occurs in picoseconds. Phototoxicity due to light overexposure is also a challenge, as is increasing the scale and speed at which samples are processed.

Several stakeholders highlighted the need for a larger range of **probes** for multiplexing that are sensitive and do not compromise cellular integrity. For example, in the EM field, there are limited numbers of suitable markers and DNA and RNA probes. Furthermore, alternative labelling

techniques such as immunolabelling can compromise cellular morphology and cytochemical staining only allows for detection of one marker.

In regard to **multimodal imaging**, key challenges include optimising multimodal workflows to visualise the same sample across multiple scales and optimising protocols to transfer samples between different imaging systems. For example, the lack of an optimised protocol to maintain freezing conditions when transferring samples from Cryo-EM to Focused Ion Beam Scanning Electron Microscopy (FIB-SEM) is limiting these techniques from being combined.

Stakeholders highlighted improvements are needed in 3D imaging techniques to increase the signal-to-noise quality in line with what can be achieved in 2D imaging techniques. Moreover, methods are largely being developed to study single cells and more technological developments are needed to image multicellular organisms. Intravital microscopes and clearing techniques are helping to visualise whole specimens, however clearing techniques are not compatible with studying live specimens. The emergence of phase corrector plates hold promise to enable imaging of larger specimens over wider fields of view, however they are expensive and currently not widely available.

1.3.2 Access to specialised bioimaging equipment and facilities

Challenges to accessing cutting edge imaging technologies in HICs and LMICs were reported by interviewees from both our scoping and stakeholder consultations. This situation is exacerbated by the fact that there is **limited funding for research infrastructure** worldwide (including in the UK, Uruguay, South Asian and African regions). Many stakeholders emphasised smaller research groups (even in HICs) can struggle to get access to state-of-the art imaging technologies through competitive selection processes run by national or international imaging facilities. UK-based stakeholders commented that some world class universities and institutes with state-of the art bioimaging technologies (e.g. Russell Group universities, the Francis Crick Institute) do not offer access to external users when the equipment is underutilised, which limits the type of research external research groups can conduct.

One UK-based researcher commented that the discontinuation of Wellcome Infrastructure grants has left a gap in the landscape while a South Africa-based researcher highlighted that with limited regional funding for purchasing bioimaging instruments, often only microscopes that can be modified to have additional functionality are bought. However, additional funds are then required for the customisation. For imaging facilities that are run on a cost-recovery model, both in HICs and LMICs, certain specialised or complex techniques have high access fees, which creates further barriers to use. In some cases, imaging facilities have closed or scaled down in the absence of a financially sustainable model. For instance, the Micron Advanced Bioimaging Unit became one of the largest core imaging facilities in the UK with Wellcome support but had to be scaled down when Wellcome funding ended.

The **location of centralised bioimaging facilities** can limit access to cutting-edge imaging technologies in both HICs and LMICs. In particular, LMICs have a 'technology gap' because the latest imaging technologies are usually not available locally, which results in greater use of locally available traditional microscopy techniques. Transporting samples over long distances and lack of specialised equipment to prepare samples on-site are also barriers limiting access to regional imaging facilities.

Some UK-based researchers highlighted volume EM, light sheet microscopy and FIB-SEM as imaging **modalities that have not quite realised their potential** as they are expensive to access and only available in a limited number of facilities. One stakeholder highlighted positron emission tomography (PET) as a technique that offers high sensitivity and allows researchers to follow metabolic processes in real-time but is not widely available. It is further limited by a lack of radiochemistry infrastructure to produce radioactive tracers.

Researchers working in the **infectious diseases** area reported not being able to fully exploit cutting-edge bioimaging technologies (e.g. Cryo-EM and lattice sheet microscopy) because experiments need to be conducted under containment or with specialised protocols to ensure safety. In the UK, only a few cutting-edge bioimaging facilities (e.g. the Francis Crick Institute, Pirbright Institute) have adapted set-ups to use microscopes safely with infectious organisms.

Many stakeholders reported adoption of new, emerging imaging technology is hindered by a **lengthy commercialisation process**. In some cases, companies can take up to eight years for a new bioimaging technology to reach the market. Furthermore, companies can charge high prices for new imaging technologies when there are few competing suppliers. For example, single molecule microscopy is a mature technique but is restricted to a small number of labs because only a few companies sell the instrument and that too at a high cost. Several stakeholders commented that many customised microscopes developed in research labs are not commercialised, which limits wider adoption. Even when the details for customising a microscope are published, most research labs do not have the relevant expertise to reproduce the technology. One UK-based researcher suggested that university spinouts that commercialise new imaging technologies could be a faster route to market (e.g. Oxford Nano Instruments) and wider adoption; however university technology transfer offices are typically less experienced at spinning out companies producing new bioimaging technologies than those commercialising new drugs.

With regard to development of new technologies, several interviewees reported a **lack of dedicated funding** for projects that take concept to design, including for commercialisation projects. A couple of interviewees commented that current funding schemes tend to focus on achieving impacts on health, and not enough is done to invest in technology development and commercialisation (e.g. in the field of microscopy) or in biomaging services for researchers. There is also a lack of funding for alternative technology development projects such as open hardware initiatives, which require significant investment to improve the ecosystem of companies that can take a design to a prototype.

Government funding often goes to 'big ticket' items rather than basic equipment or maintenance contracts leading to **long term sustainability issues** according to the scoping interviews. This was confirmed by many interviewees in our stakeholder consultation. Other availability challenges included supply chain issues that can prevent expensive bioimaging equipment from being purchased within the expected funding window (resulting in loss of allocated funding) and reluctance of universities to invest in new imaging instruments that may require long optimisation times before publishable results can be produced.

1.3.3 Bioimaging data accessibility, reuse, and integration challenges

Scoping and stakeholder interviews highlighted that **inadequate data infrastructure** that does not match the size and complexity of imaging data generated is a key barrier to making full use of state-of-the-art imaging technologies. Lack of access to sufficient computing power to process and analyse bioimaging datasets is hindering scientific progress. For instance, while bioimaging data can be collected within days, data analysis can take months, which delays publication of results and testing of new hypotheses. LMIC-based scientists who access state-of-the-art bioimaging facilities and methods in HICs often cannot process their data in their own country according to a few researchers interviewed at the scoping stage.

Many stakeholders (mainly from HICs) reported that advances in bioimaging technologies such as high-content and -throughput technologies (e.g. volume EM and light sheet microscopy) have led to the generation of **large, complex datasets**, which has brought data handling, storage, sharing and analysis challenges. Some stakeholders emphasised the development of data analysis methods need to go 'hand in hand' with imaging technology developments, otherwise the potential of new technologies will not be fully realised.

Enabling **effective management, analysis, sharing and reuse of data** is expected to transform bioimaging according to most interviewees. Hence, accessible, unified and centralised data repositories at national or international level are needed to democratise access to bioimaging data. For instance, it was reported that universities do not invest enough in data storage facilities resulting in data being stored on local hard drives and thus not accessible to the wider community. Access to and reuse of imaging data was considered important to generate new biological insights, ensure data is trustworthy and replicable and the right conclusions are drawn. Furthermore, such data could, in principle, be used for training AI-based models for data analysis.

The **lack of common or agreed metadata standards** for depositing raw bioimaging data was cited by several stakeholders as another barrier limiting data reusability, although it was noted that some bioimaging modalities have good metadata standards (e.g. EM) whereas others do not (e.g. light microscopy). Lengthy data curation times and trust and privacy issues were cited as other barriers limiting data being deposited. Some LMIC-based interviewees stated that LMIC-based researchers tend to quite protective of their data and hence are uneasy about sharing it with others. In addition, according to one bioimaging network there is a funding gap globally around the aspect of 'making data fair'.

Data integration challenges, e.g. combining data from different imaging modalities or combining bioimaging data with datasets from other fields (e.g. 'omics' data) were cited as a major bottleneck by many stakeholders. This is partly due to the lack of agreed metadata standards as noted above, and also due to a lack of robust protocols for combining and analysing large, complex bioimaging datasets.

Many stakeholders highlighted the **need for advances in software to enable analysis of large, complex bioimaging datasets**. They emphasised that the resultant data analysis solutions should preferably be fast, automated, user friendly and generalisable for different research questions as this is currently limiting the transformative potential of some technologies, especially high-throughput approaches. Bioimage.IO was given as an example of a collaborative platform that is being developed to bring AI-based models to the bioimaging community, but it is not fully used and needs further development. Moreover, some stakeholders were concerned about the reproducibility of AI-based data analysis methods.

Some of the stakeholders interviewed pointed out that the best image analysis software is often proprietary rather than open source and can be costly. The cost of data analysis software cannot always be covered by research grants (e.g. annual subscription to ARIVIS software for multi-modal, multi-dimensional microscopy data[1] can be in the region of £20,000 according to one interviewee), which can put it out of reach for resource-poor labs and countries.

Individual interviewees identified specific areas where current data analysis methods need further improvement such as image restoration and denoising, overlaying of images, nuclear and cell segmentation and automated (e.g. machine/deep learning-based) identification of objects of interest.

1.3.4 Career development and talent retention

Lack of availability of trained personnel is a major barrier affecting access and use of bioimaging infrastructure according to those interviewed as part of the scoping and stakeholder interviews. Core imaging staff and data scientists working with bioimaging

[1] https://www.arivis.com/

equipment and data do not have separate career paths or permanent positions in most countries, making it difficult to retain talent in the field of bioimaging over a long time.

Several interviewees (from HIC as well as LMIC) provided examples of **'brain drain'** to industry, especially for PhDs and postdoctoral scientists as universities and institutes cannot compete with the higher salaries offered in the private sector. In LMICs, PhD graduates and postdoctoral scientists often relocate to HICs where better career opportunities are available. Furthermore, LMICs can struggle to attract PhDs and postdoctoral scientists with the requisite skill set. An inability to retain and attract skilled and experienced staff also prevents critical mass being reached in some LMICs and limits the use of certain cutting-edge technologies, leaving expensive equipment underutilised.

1.3.5 Lack of knowledge or understanding of imaging technologies / techniques

Many stakeholders in LMICs and HICs agreed that there is an urgent need to scale up training activities across all career levels. This is important to increase **awareness and understanding of available bioimaging technologies, techniques and methods**; their relative advantages and limitations; and how they can be used. For example, multiphoton microscopy is a powerful technique for live cell imaging, but according to one interviewee, it has not been taken up widely as researchers do not understand how to use it. In contrast, it was also noted that sometimes researchers prefer to stick to technologies they are familiar with rather than train in new techniques. Communicating the limitations of specific bioimaging technologies, techniques, and methods was considered important to avoid mistakes and encourage further development.

Several stakeholders reported that **bioimaging training courses** tend to be oversubscribed. Furthermore, the most useful courses are the ones that provide hands-on experience, but these can be very expensive (e.g. confocal training courses are around £2000 at subsidised price) and difficult to scale up to large numbers of trainees. In addition, it is not always possible to find the right level of expertise and capacity for delivering such training courses, especially since going forward training needs to be designed for the next generation of bioimaging scientists who will require a broad skillset to work in interdisciplinary and multimodal pipelines.

1.3.6 Interdisciplinary challenges

Bioimaging technology development is usually done by computer scientists, physicists and engineers with clinicians and biologists being the usual end-users. However, many interviewees indicated there is **inadequate communication between disciplines** such that technology development for bioimaging is not always accessible or relevant to users. Smaller research groups (even in HICs) can particularly struggle to bring in expertise from outside of bioimaging and life sciences. Thus, more needs to be done to support cross-fertilisation between disciplines, but funding is not always readily available for this purpose, especially in LMICs.

Lack of a joined-up approach, where developers of imaging technologies work alongside end-users, is limiting new technologies from being adopted because they are often designed without a specific application in mind, according to some stakeholders. Furthermore, there is a lack of skilled people that can work at the interface between computer science and imaging to develop and apply new imaging technologies and software.

Some stakeholders highlighted that many imaging techniques developed to answer a research question in one research field do not benefit other research fields as there is a lack of cross-over between different research communities. For example, some computing and data solutions developed by the medical imaging community could be of benefit to biologists. Other **'untapped' research communities** that could benefit from the development of new or adoption of existing imaging tools or technologies include neuroscience, plant science, food science, agriculture, materials engineering and structural engineering.

Research culture also creates barriers to interdisciplinary discussions and collaborations. For example, assigning first and last author positions for a publication can be difficult when contributions from different disciplines were equally valuable and a lack of experienced reviewers to assess interdisciplinary grant applications can result in potentially transformational projects going unfunded.

1.4 Solutions to address barriers and challenges in bioimaging

1.4.1 Improving access to bioimaging technologies and techniques

Many stakeholders were of the view that it is preferable to have a few **centralised regional imaging facilities** offering a variety of bioimaging techniques with dedicated expert support rather than individual labs hosting bioimaging equipment. It was suggested that this type of model can help to improve access to and democratise bioimaging techniques because expensive and bulky equipment could be hosted in one place with the requisite trained personnel who know how to run the equipment, can support sample preparation and can provide technical advice and support to end users. Conversely, the advantages of **local imaging facilities** were also highlighted such as lower travel costs, ease of transporting samples and quick iteration of experiments. Some stakeholders indicated the need for open access bioimaging centres of excellence to lead on developing new technologies, methods and multimodal pipelines.

One suggested model to improve access to imaging infrastructure and expertise was to fund **short-term mobility grants** to cover research visits to imaging facilities ranging from durations of a few weeks to a few months. Individual stakeholders from both HICs and LMICs supported such a scheme which in their view would facilitate greater use of bioimaging techniques to answer novel research questions, more efficient use of resources as well as knowledge transfer and diffusion of new methodologies. A UK-based stakeholder reported that a collaboration with researchers in South Africa to provide remote access to X-ray and electron imaging technologies is helping to build a local user base, which may help build a case for a regional centre in South Africa. Another UK-based stakeholder reported donating microscopes that had been superseded to LMICs to increase access to certain imaging methods.

Some stakeholders suggested having a 'rolling fund' for small grants to enable rapid access to emerging imaging technologies. These grants could facilitate adoption of such technologies and generation of data to secure future research funding. The UK Engineering and Physical Sciences Research Council's (EPSRC's) Laser Loan Pool[2] initiative, which ran from 2005 to 2015, loaned equipment to researchers to conduct feasibility experiments prior to grant applications and was cited as an effective mechanism that could be adopted to increase access to imaging technologies. Some stakeholders suggested that inclusion of user access fees in research grant applications would help ensure sustainability of core imaging facilities through cost-recovery models.

Many stakeholders felt there is a gap in the funding landscape for **grants that support technology development and commercialisation** of imaging technologies. The UK Biotechnology and Biological Sciences Research Council's (BBSRC's) 'Better methods, better research'[3] and 'Technology development for the biosciences' grants were given as good examples of grant programmes supporting method and technology development for the wider biosciences research community. Similarly, some stakeholders suggested the need for grants to support commercialisation and scale up of nascent technologies, which could

[2] https://www.clf.stfc.ac.uk/Pages/The-Laser-Loan-Pool.aspx

[3] https://www.ukri.org/what-we-offer/browse-our-areas-of-investment-and-support/better-methods-better-research/

include grants to support spin-out activity or grants for companies and/or imaging facilities to develop user-friendly imaging technologies that would add the most value for the bioimaging community.

Stakeholders also emphasised the continuous need for grants or funding for infrastructure and equipment as well as for maintenance and service contracts to help sustain and expand use of existing imaging technologies. Open 'hardware' was also seen as a good option for promoting reproducibility and accessibility in LMICs and HICs, as it can reduce costs and facilitate linkage across bioimaging scales.

1.4.2 Improving bioimaging data accessibility, reuse, and integration

Stakeholders put forward several suggestions for solutions that could be implemented to overcome challenges in bioimaging data accessibility, reuse and integration. Suggestions included **grants for data repositories, open-source software development and establishing common data standards** to improve reuse and integration of data from different sources.

Opportunities were also identified by some interviews in terms of developing standard tests for data assessment and verification of deep learning (AI) and other techniques towards reduce the number of methodological elements that are not fully understood and which can jeopardise interpretation of research findings. These tests if made widely available to researchers could contribute towards the development of **standard imaging protocols.** Automated microscopy workflows were seen as a way to decrease the impact of the imaging on the sample (e.g. phototoxicity) and facilitate real-time identification of objects of interest for imaging.

Some stakeholders felt that publishers and funders should set **obligations** to ensure researchers deposit bioimaging data. For example, the US National Institutes of Health (NIH) are implementing a policy change where all research grants will need to include a data management and sharing plan, which was viewed as a step in right direction.

1.4.3 Career pathways for imaging and data scientists

Many stakeholders emphasised the need to support separate career paths for core imaging staff and data scientists, recognising that their profiles look different than those of other researchers. Permanent positions with competitive salaries, opportunities to apply for their own R&D grants and different criteria for assessing their scientific capabilities and contributions were other suggestions.

1.4.4 Improving understanding and dissemination of bioimaging techniques

Stakeholders suggested increasing training opportunities and courses to promote awareness and adoption of new and existing bioimaging techniques. They showed support for more initiatives that organise and coordinate access to training opportunities, for example, a scheme of the Chan Zuckerberg Initiative that supports training of researchers in new imaging modalities.

Other suggestions included the inclusion of a dissemination plan in technology development grants to scale-up uptake of new technologies and dedicated funding for the creation and dissemination of imaging technology guides.

1.4.5 Addressing interdisciplinary challenges

Stakeholders indicated the need for more cross-disciplinary and cross-sectoral dialogue and collaboration. Many stakeholders suggested the need for funding 'high risk high reward' interdisciplinary science to accelerate innovation in bioimaging. Some stakeholders suggested Wellcome could be more 'catalytic' in facilitating interdisciplinary collaborations. The

Wellcome Leap initiative was described as an effective example of how new interdisciplinary teams could be fostered to solve complex problems. The US Advanced Research and Invention Agency (ARIA) programme and Swiss National Science Foundation's SPARK programme were cited as good examples of funding mechanisms that support high-risk research.

Many stakeholders highlighted the need for initiatives to bridge the gap between imaging and computer science fields to advance the development of user-friendly and generalisable image analysis software tools that address data integration and analysis challenges. NEUBIAS (Network of European Bioimage Analysts) and the EU-funded AI4LIFE initiative are examples of interdisciplinary initiatives that are trying to bridge this gap.