

## Survey Report on Training, Knowledge and Skills needs in Digital Health

### Background:

EPSRC's Healthcare Technologies team, Innovate UK and the Knowledge Transfer Network conducted two surveys (one for the academic community and one for the business community) to gain views on training available and knowledge/skills needed in digital health for the UK. The outcomes of the survey will inform us about how we can best support our academic and business communities with the training and skills needed to support the development of digital health solutions.

### Objectives of survey:

- To identify the skills, training and knowledge requirements needed to support the development of transformative digital health solutions.
- To define the skills and knowledge requirements needed to accelerate the translation of digital technologies into the healthcare sector.
- To identify any gaps in the current UK digital health skills, education and training offering that are needed to deliver bullets one and two.
- Identify new ideas to address any knowledge and skills gaps to advance the development, translation/adoption of transformative digital solutions into the healthcare sector.

### Survey results:

#### Academic Survey:

#### Type of respondents:

We had 88 survey respondents who were from a variety of organisations and research disciplines, a word cloud showing which research disciplines respondents were from is below.



Text size indicates the number of times a word or phrase was mentioned.

### Technical challenges

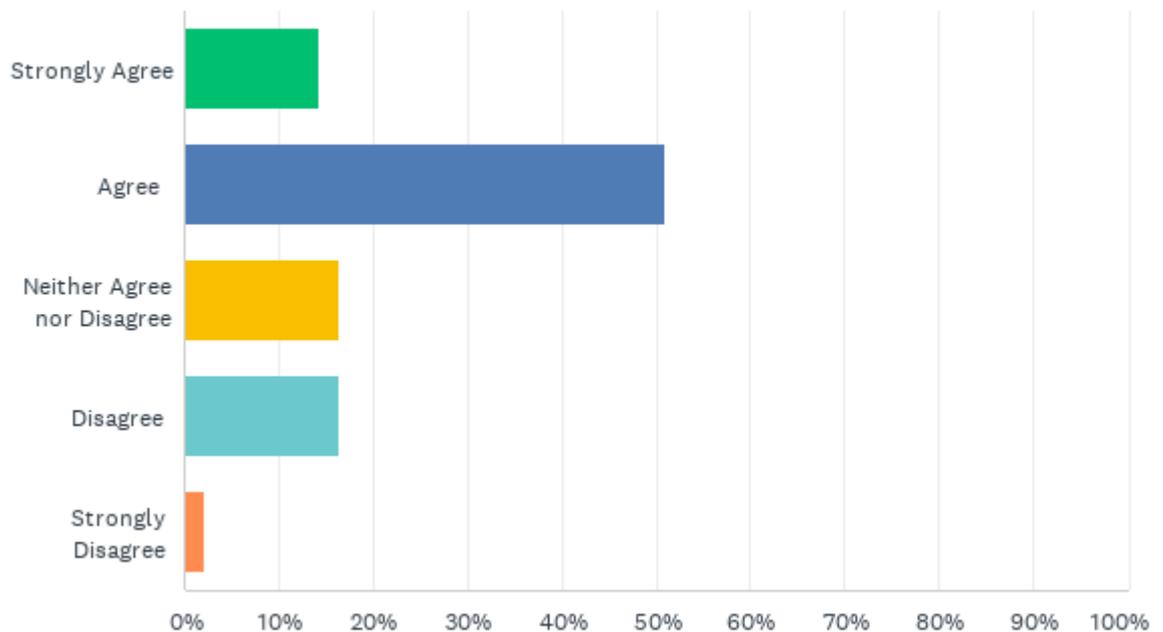
We asked what respondents believed to be the top three **technical** challenges to developing new digital technologies to be used in clinical and/or healthcare settings. Answers could be clustered into the following areas:

- 1. Understanding of the whole regulatory pathway**  
This included understanding of clinical trials, testing/evaluation of technologies, regulation, deployment, and maintenance.
- 2. Understanding the medical and care environment and working with clinicians**  
Survey respondents mentioned lack of clinical domain knowledge, understanding ethics and access to patients, clinicians lacking technical skills, clinicians not having the time to input into projects, academic and clinical colleagues speaking different languages.
- 3. Identifying user needs and working with users**  
This included a lack of support for technologists to reach out to end users, identifying user needs and iteratively designing solutions, lack of giving control and choices to end users, difficulty of accessing patients to undertake early testing of devices and conceptualising new technologies.
- 4. Data Security**  
Survey respondents mentioned understanding of data security and designing for appropriate user privacy.
- 5. Resources and costs associated with developing new digital technologies**  
Responses focussed on the costs required to make a good quality device and a lack of staff with specialist knowledge.
- 6. Data collection, access, and integration**  
Answers focussed on the difficulties of integrating new tech into existing systems, diversity of data sources and different levels of availability and the ability to collect, access and refine data.
- 7. Industrial Relationships**  
Survey respondents felt that developing good business relationships was a key challenge as commercialising solutions depended on this.
- 8. NHS Infrastructure and Systems**  
Some themes mentioned under this heading were: understanding decision making processes in the NHS, out of date infrastructure and ensuring that technologies developed will fit into the existing healthcare delivery framework.

### 9. Other

Other issues raised were a lack of basic understanding of Human Computer Interaction issues needed for design, learning to work and operate in cloud-based settings and safe software deployment environments separate from operational systems.

We asked whether researchers felt that the technical challenges relating to developing new digital technologies to be used in clinical and/or healthcare settings could be addressed through training. 64% of survey respondents agreed or strongly agreed with this statement. (See graph below)



There wasn't a preference on whether this training would be delivered virtually or in person. However, some suggestions for delivering the training were: internships into healthcare environments, industry-academic collaboration e.g., PhD sponsorship, showcasing best practice, awards, and self-paced learning.

#### Non-technical challenges

We asked what respondents believed to be the top three **non-technical** challenges to developing new digital technologies to be used in clinical and/or healthcare settings. Answers could be clustered into the following areas:

### 1. Engaging Stakeholders

This included understanding practice and the people in the system and understanding barriers/challenges in integrating solutions in everyday use in healthcare systems by ensuring acceptability and trust, user acceptance and engaging the private sector at pace and scale.

### 2. Evidence of efficacy and procurement, regulation

Survey respondents mentioned difficulties of the regulatory approvals process, regulatory evidence of effectiveness in the real world and the difficulties in understanding and engaging with the procurement process.

### 3. Career Paths

Answers focussed on the difficulties around understanding and defining career pathways for researchers and practitioners in digital health.

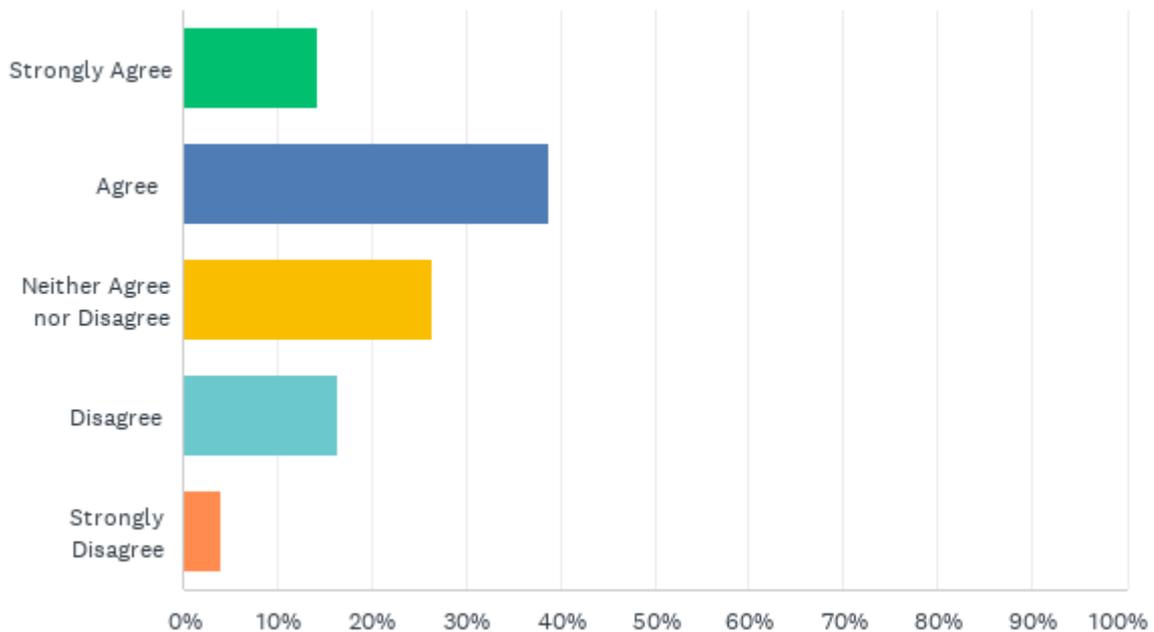
### 4. Ethics and data privacy

Some themes mentioned under this heading were: engaging with bodies responsible for ethics, timeframe for NHS ethics, working with the new digital technologies in accordance with GDPR and privacy challenges.

### 5. Other

Other issues raised were having an international perspective and understanding the different markets and cultures beyond the NHS, supporting genuine interdisciplinary research, the conflict between IP protection and open science/impact, availability of funding to span Technology Readiness Levels 4-6 and access to finance which understands the sector.

We asked whether researchers felt that the non- technical challenges relating to developing new digital technologies to be used in clinical and/or healthcare settings could be addressed through training. 53% of survey respondents to that question either agreed or strongly agreed with this statement. (See graph below)

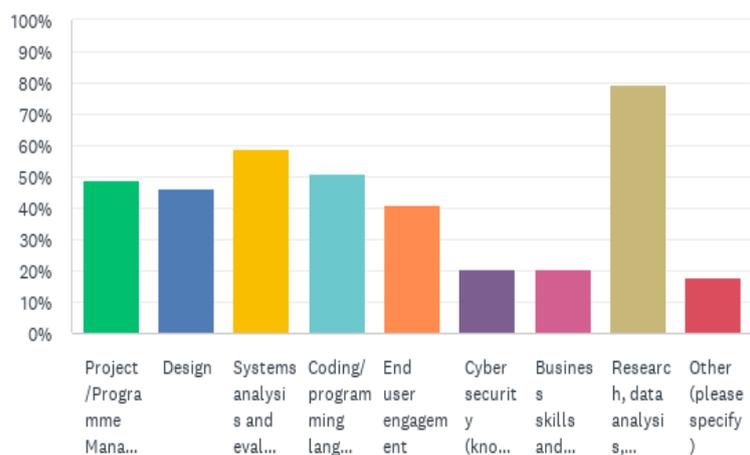


There was a slightly stronger preference for the training to be delivered in person for non-technical challenges 56% vs 44% for virtual delivery.

Training in digital health

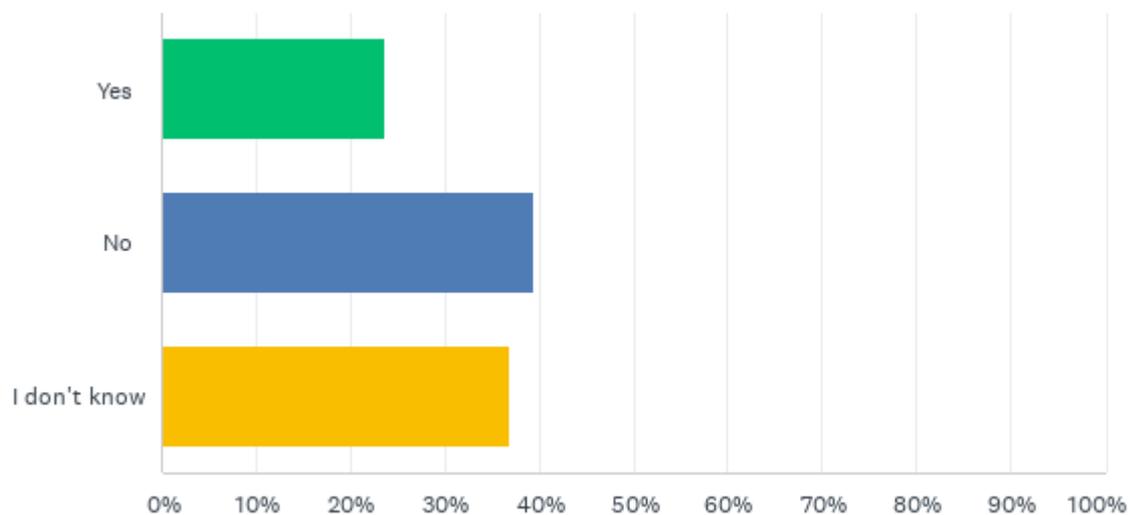
Most people who responded to the survey either agreed or strongly agreed that some areas of training in digital health are under resourced.

We asked survey respondents what the main skills were that they looked for in recruits working with digital health technologies. The most sort after skill was research, data analysis and analytical skills followed by systems analysis and evaluation. See graph below:



Respondents identified the following other skills that were important: risk management, engineering device development, experience in industry, specific technology skills e.g., electronics, optics, machine learning, governance and compliance framework awareness, data Governance, and communication.

We asked survey respondents whether new recruits working within digital health technologies have the necessary skillset required. 39.5% of survey respondents thought they didn't have the skills required. (See graph below):



18% of respondents were aware of existing training to address skills gaps in new recruits. These are:

- CPD courses e.g., on regulation
- PhD training e.g., Centres for Doctoral Training
- Taught Masters Programmes e.g., UCL MSc in Health Informatics
- Q Labs to address stakeholder engagement needs
- NIHR Learn
- Academy for PhD Training in Statistics
- Training on the job e.g., GDPR

80% of respondents felt there was a need for additional skills training.

We asked respondents whether there were any centres that had best practice in training and skills in digital health. Below is a list of centres/ training programmes that were suggested:

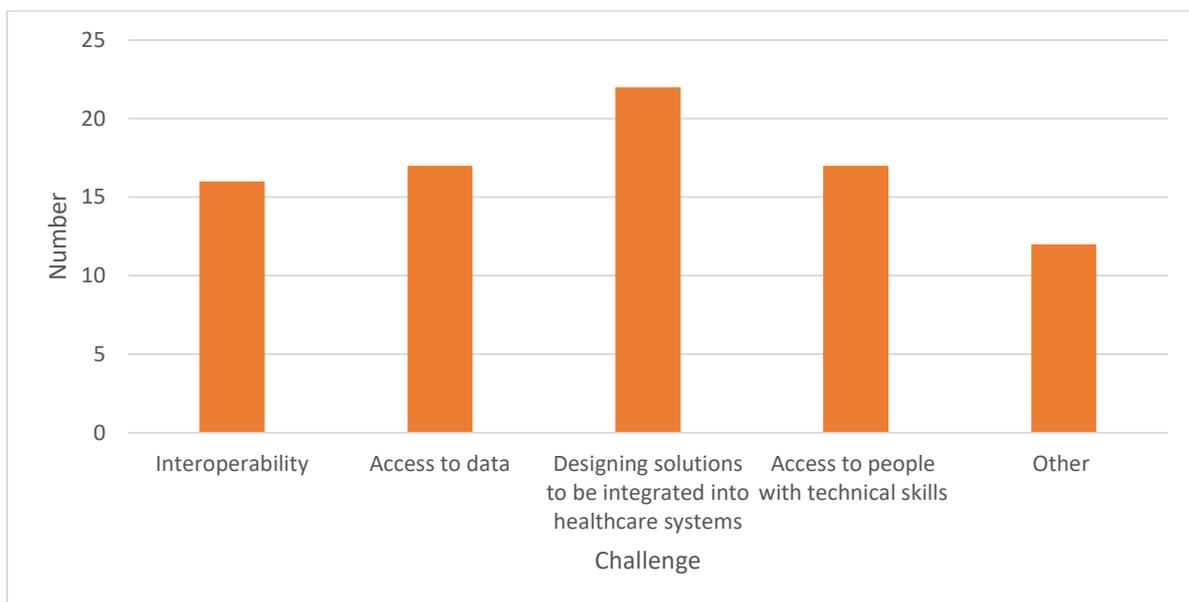
- Q Labs UK scheme
- Centres for Doctoral Training
- National Horizons Centre
- Digital Health Leadership course (Imperial College London)
- Division of Informatics, Imaging and Data Science, The University of Manchester
- NIHR Learn
- Translate MedTech training courses
- Medipex training courses
- Medilink network and workshops
- The Alan Turing Institute
- Many centres across the UK who have complimentary expertise
- The Medical Device Manufacturing Centre at Heriot-Watt University
- UCLH Data Science fellowships
- NHS Digital Academy
- itpro.tv, pluralsight, acloudguru, CBT nuggets
- LinkedIn, Pluralsight, Coursera

### Business Survey:

We had 34 survey respondents who were from a variety of organisations within the digital health field.

### Technical challenges

We asked what respondents believed to be the top three technical challenges to developing new digital technologies to be used in clinical and/or healthcare settings. The highest rated response was designing solutions that could be integrated into healthcare systems. The graph below shows the challenges identified and number of responses for each.



The following responses were listed as 'other' challenges:

- Low level of technical ability from the sector experts that can use the technology
- Clarity in HMRC and NICE's Evidence Standards Framework for Digital Health Technologies requirements
- Security of data and data holding allowing timely retrieval
- Ensuring usability and effectiveness
- Regulatory expertise
- Culture in NHS IT/eHealth
- Access for funding to support implementation
- User design
- Complexity of the UK Health and Care system particularly for SMEs developing innovations who are new to e-health and digital health sector

We asked survey respondents: from the challenges you have identified are there any that you feel could be addressed by providing more training?

10 respondents agreed that these challenges could be addressed by training and skills. Respondents had the following views on this:

- A lot of skills are transferable from other industries.
- Prioritising the technological upskilling of the users of the technology is important.
- Technical expertise from Augmented Reality and Virtual Reality specialists is needed.
- Access to stakeholders is a challenge.
- People with technical skills around programming and people who can understand/relate to user needs are important
- Innovators and health care professionals need to be incentivised to get together and collaborate.
- The primary challenge to overcome is proving that a system is data secure.
- Experience still plays a major role in advancing the skills acquired by training.
- Understanding the NHS' protocol and processes is a challenge.
- Data Analytics, rules-based decision making, and user design are important challenges.
- There is a real need to train staff at all levels of the health care sector (primary, secondary, and tertiary) in what the adoption of digital solutions means for patients, carers, front line staff, managers, commissioners, and funders. This should be done at the earliest possible stage in the career of the staff member.
- There is a need to educate (or at least more clearly articulate) what is expected from suppliers, particularly if those suppliers have an innovate and disruptive product of service and who to connect with first, NHSD, NHSX or NHSE?
- Designing solutions to be integrated into healthcare systems with changes to NHS configurations and ICS is a challenge
- Support for change management and SME engagement is important
- A baseline NHS structure, systems, compliance business driver's awareness programme may help
- Accessible procurement and commissioning are a challenge.
- More firmware training, specific to Digital health/ cloud-based services

There was a stronger preference for the training to be delivered both virtually and in person.

#### Non-technical challenges

We asked what respondents believed to be the top three **non-technical** challenges to developing new digital technologies to be used in clinical and/or healthcare settings. Answers could be clustered into the following areas:

1. **Regulatory Approval**
2. **Engaging stakeholders**
3. **Commissioning/Procurement**
4. **Evidence of efficacy**
5. **Commitments and Funding**

We asked survey respondents: from the challenges you have identified are there any that you feel could be addressed by providing more training? Most respondents agreed that these challenges could be addressed by training, other comments were:

- Providing training is just short-term solution. Educating the stakeholders is long term mission.
- Commissioning and procurement seem to be constrained by systems boundaries and resistance to innovation.
- More opportunities and funding for collaboration as well as training
- Contracting or collaborating with people with the right expertise is still required.
- We need more training on how to get access to the approval we need.
- Understanding the NHS' protocol and processes.
- Commissioning and Procurement are key.
- Regulatory approval is essential that non-technical people understand the guidelines in which they work.
- The NICE digital health technology approvals pathway is a good starting point to how technologies can consider addressing these challenges, but this pathway needs to be integrated and adopted across all aspects of clinical education and care provision/commissioning
- Regulatory, Commissioning, and Business Casing (Outcomes/Efficacy)
- Less training and more facilitating introduction to stakeholders.
- Mentoring would be helpful.
- Training for current and future regulators is mission critical to the speedy adoption of new technology.

All survey respondents agreed that training could be delivered either virtually or physically.

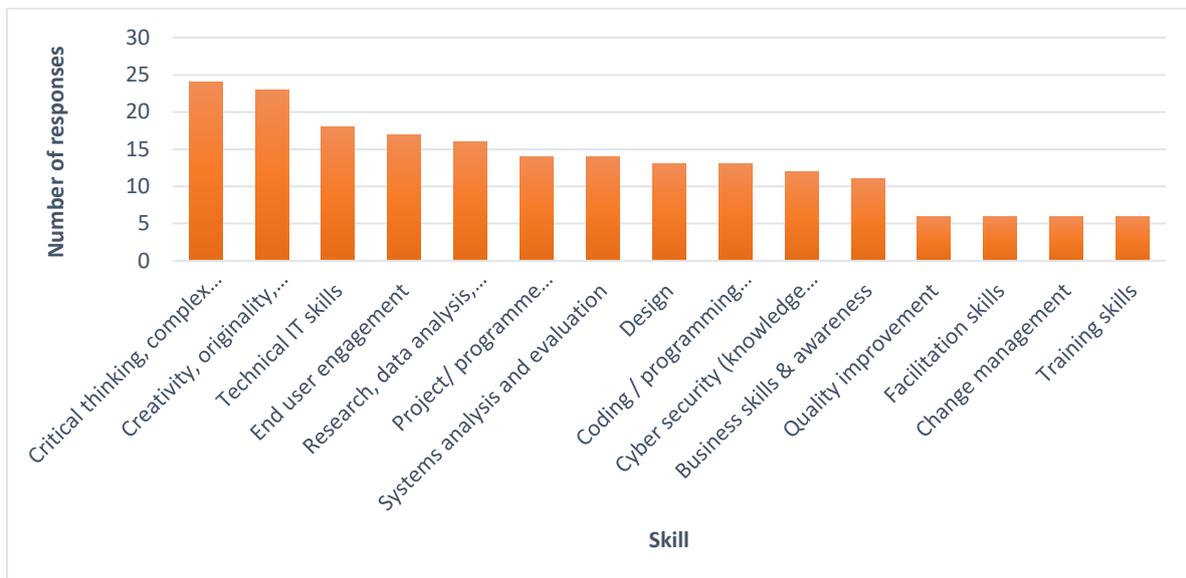
#### Training in digital health

We asked participants if they were to select one area of training in digital health that is currently under resourced, what would it be and why?

- Managing relationships between commercial enterprise and NHS stakeholder groups
- End user engagement
- Engaging stakeholders
- Understanding of Evidence Standards Framework for Digital Health Technologies and other requirements for NHS adoption.
- The management of digital healthcare hardware and the interoperability is under-resourced. It would be helpful if a stream for apprenticeship in digital healthcare is developed in conjunction with British Computer Society (BCS).
- AI/ML modelling of medical diagnosis capabilities
- Clearer understanding on how to link technology to benefit the NHS.
- Ability to understand & navigate incredibly complex & often hidden digital healthcare landscape & its stakeholders
- Commissioning/procurement of digital health.

- Social Care adoption
- Evidence of efficacy
- Systems Thinking / Systems Design
- Regulatory to understand what is possible and what isn't and how data can be legally exchanged and stored.
- Standards
- Use of Unconventional techniques
- Integration of digital health solutions into the NHS existing systems.
- Blockchain technology and web3 in healthcare supply chains

We asked survey respondents what the main skills were that they looked for in recruits working with digital health technologies. The highest rated skill was critical thinking followed by creativity. See graph below:



We then asked, what are the main skills shortages you face when developing digital health technologies? Answers are below:

- Ethics of collecting and using healthcare data, practical regulation guides the digital technologies in health / healthcare industry
- Technical IT skills, manifest in AR / VR and AI.
- Critical thinking, complex problem-solving & analysis, Project/ programme Management skills
- Achievable, recognised cyber security standards for the public sector
- People with the right skill and experience to plug into extant technologies, or even adapt from other sectors to benefit the healthcare sector.
- Data Science skills.
- A lack of communication, design, systems analysis and evaluation skill sets when dealing with technical digital health in IT.

- Data analytics and creative thinking are major issues, as is design/UX and business acumen (to design to needs rather than creating tech push)
- Change Management
- People with technical expertise and clinical expertise at the same time
- Systems thinking, cyber security, cloud services, Business Case understanding of risk/reward, project management skills, regulatory understanding
- Identifying and selecting appropriate people that have these skills.
- Systems analysis and evaluation
- There are skills shortages across all sectors (firmware, hardware and software) in the UK, but ample skills internationally.
- Data analytics and data integration.
- Access to experienced developers at an affordable cost level
- Access to Patient data through partnership IT relationships and skills
- Good development skills & product management skills

We asked respondents whether there were any centres that had best practice in training and skills in digital health. Below is a list of centres/ training programmes that were suggested:

- HVMC is commissioned by DfE to bring a upskill training project at Industrial Digitalisation Technologies. The mechanism and funding route could be used for digital health skills and training.  
[https://emergingskillsproject.com/courses/list/?tribe\\_eventcategory%5B0%5D=1367](https://emergingskillsproject.com/courses/list/?tribe_eventcategory%5B0%5D=1367)
- STEAMhouse at Birmingham City University <https://steamhouse.org.uk/> is excellent and very generous at sharing knowledge and skills. The centre is more focussed on business in general and doesn't focus on digital health - but it is the future of digital health with its expertise in AR and Virtual Worlds (= virtual doctors, life buddies etc)
- The Hill Partnership in Oxford provide a well led centre of excellence, in relation to advancements in digital health.
- Arts Council England Tech Champions - see <https://www.artscouncil.org.uk/developing-digital-culture/digital-culture-network>
- The Healthcare & Design Masters is a program offered jointly by Imperial College and the Royal College of Art, this is the only dedicated program I know of but it is a masters so it requires a significant investment of time. It would be great to learn about other shorter training programs.
- University of St Andrews, University of Dundee and University of Northumberland
- Turing Institute
- Arwn Institute Swansea University
- Nottingham Trent University Med /Chem lab
- Keele University, Birmingham University, Warwick University
- FIFY Limited

## Conclusions

Some conclusions from both surveys:

- Academic respondents felt that the key technical challenges with developing digital technologies were understanding the regulatory pathway, working with users and health professionals, data security, resources, data collection, access and integration and industrial relationship building.
- Industrial respondents felt that designing solutions to be integrated into health systems was the biggest challenge but also highlighted user design and access to people with technical skills.
- Both academics and industrialists agreed that technical challenges could be addressed through training.
- Academic respondents to the survey highlighted the following non-technical challenges: engaging stakeholders, evidence of efficacy, procurement regulation, career paths in this field, ethics, and data privacy.
- Both industry and academics agreed non-technical challenges can be addressed by training.
- Academics felt that some areas of training are under resourced.
- The main skills academics looked for when recruiting were research and data analysis, systems analysis, and evaluation. Industry looked for critical thinking skills.
- Industry and academia agreed that data security and working with users was an important skill.
- Enabling collaboration, networking and engagement with industry, academia, users, and health professionals came out as a key gap.
- There are centres across the UK with some expertise in delivery of training, but they seem un co-ordinated and don't cover all training needs.